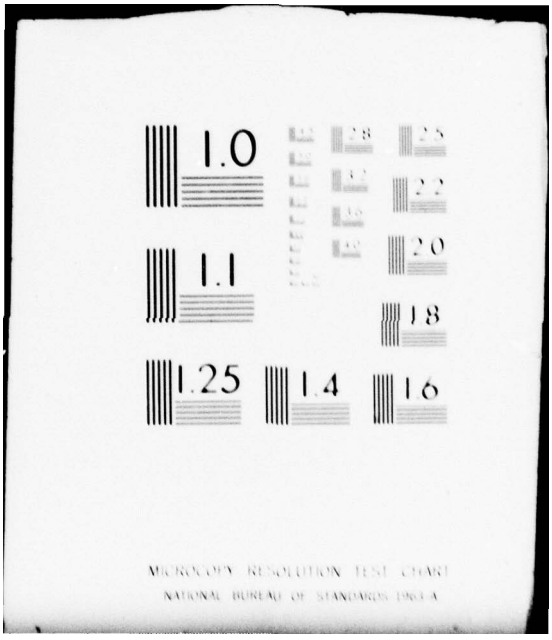
AD-A067 086 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 5/1
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
JAN 79

UNCLASSIFIED NL

1 OF 5
AD
A067086




1.0
1.1
1.25
1.4
1.6
2.8
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

AD A067086

LEVEL III

VOLUME II

Supporting Data FY 1980
Budget Estimate

12

DDC
RECEIVED
APR 9 1979
C

Submitted to CONGRESS January 1979

Descriptive Summaries Of The

This document has been approved for public release and sale; its distribution is unlimited.

RESEARCH DEVELOPMENT TEST & EVALUATION

Army Appropriation FY 1980

DEPARTMENT OF THE ARMY DEPUTY CHIEF OF STAFF
FOR RESEARCH DEVELOPMENT AND ACQUISITION
RDTE PROGRAMS AND BUDGET DIVISION

DDC FILE COPY

79 04 05

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: N/A (6)	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER: for Program Elements	
4. TITLE (and Subtitle): Volume II - Descriptive Summaries for the Research, Development, Test, and Evaluation Army Appropriation Program FY 1980. Supporting Data FY 1980 Budget Estimate Submitted to Congress January 1979.	5. TYPE OF REPORT & PERIOD COVERED
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Volume II Department of the Army	8. CONTRACT OR GRANT NUMBER(s): (12) 417p.
9. PERFORMING ORGANIZATION NAME AND ADDRESS: HQDA, Office of the Deputy Chief of Staff for Research, Development, & Acquisition (DAMA-PPR-B) Washington, DC 20310	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: HQDA, Office of the Deputy Chief of Staff for Research, Development, & Acquisition (DAMA-AOA-S) (11) Washington, DC 20310	12. REPORT DATE: Jan[illegible]1979
	13. NUMBER OF PAGES: 404
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Army Research, Development, Test, and Evaluation Budget backup for estimates submitted to Congress in January 1979 for FY 1980.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

408 992 gw

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

VOLUME II A067085

DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS

OF THE

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, ARMY PROGRAM

FY 1980

JANUARY 1979

Department of the Army
Deputy Chief of Staff for Research, Development, and Acquisition

DDC
RECEIVED
APR 9 1979
C

This document has been approved for public release and sale; its distribution is unlimited.

FOREWORD

These volumes have been prepared to provide information on the US Army Research, Development, Test, and Evaluation Program for Congressional Committees during the Fiscal Year 1980 hearings. This information is in addition to the testimony given by US Army witnesses.

These volumes contain a descriptive summary for each program element to be financed during FY 1980. Descriptive Summaries for projects within the program elements to be financed during FY 1980 for $5.0 million or more appear immediately following the applicable program element. Where there are several items under development within a project, a separate summary has been provided for each item that exceeds $5.0 million during FY 1980. A Test and Evaluation Section is provided for all major weapon systems.

There are twenty-four major weapon systems descriptive summaries appearing in Volumes II and III. Major weapon systems are identified by an asterisk in the Table of Contents. The formats and contents of these volumes are in accordance with guidelines and requirements of the Congressional Committees insofar as possible. Information previously provided in the SAC Data Book is consolidated into these volumes. The SAC Data Book information appears at the beginning of each program element descriptive summary.

A direct comparison of FY 1978, FY 1979, FY 1980, and FY 1981 data in this Program Element Listing with data shown in the Program Element Listing dated January 1978 will reveal significant differences. Many of the differences are attributable to the following factors:

a. Restructuring of the FY 1978 and FY 1979 programs for comparability to the FY 1980 program structure.

b. Reclassification to provide greater visibility and contribute to the effective management of the RDTE program such as the following:

(1) RDTE Headquarters Management.

(2) Further extension of the Single Program Element Funding Concept.

(3) Restructuring of Exploratory Development personnel RDTE programs.

The funding information used in these volumes corresponds to that contained in the President's Budget. Procurement data is shown where applicable for items in engineering or operational development. Military construction data is shown where applicable.

Distribution for
NTIS White Section
DDC Buff Section
UNANNOUNCED
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. SPECIAL
A

TABLE OF CONTENTS

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

VOLUME I

TECHNOLOGY BASE		PAGE NO.
6.11.01.A	IN-HOUSE LABORATORY INDEPENDENT RESEARCH (ILIR)	I-1
6.11.02.A	DEFENSE RESEARCH SCIENCES	I-10
AH43	RESEARCH IN BALLISTICS	I-24
AH45	AIR MOBILITY RESEARCH	I-27
BH57	RESEARCH IN SCIENTIFIC PROBLEMS WITH MILITARY APPLICATIONS	I-31
BH57-03	COMMUNICATIONS ENGINEERING AND ELECTRONICS	I-35
BH57-07	PHYSICS	I-39
AH60	RESEARCH IN LARGE CALIBER ARMAMENTS	I-43
BS01	BASIC RESEARCH ON MILITARY INJURY AND DISEASES	I-46
A31B	NIGHT VISION AND ELECTROOPTICS RESEARCH	I-50
6.21.05.A	MATERIALS	I-54
6.21.11.A	ATMOSPHERIC INVESTIGATIONS	I-59
6.21.20.A	NUCLEAR WEAPONS EFFECTS, FLUIDICS	I-64
6.22.01.A	AIRCRAFT WEAPONS TECHNOLOGY	I-69
6.22.02.A	AIRCRAFT AVIONICS TECHNOLOGY	I-73
6.22.09.A	AERONAUTICAL TECHNOLOGY	I-78
6.22.10.A	AIRDROP TECHNOLOGY	I-83
6.23.03.A	MISSILE TECHNOLOGY	I-86
6.23.07.A	HIGH ENERGY LASER (HEL) TECHNOLOGY	I-99
6.26.01.A	TANK AND AUTOMOTIVE TECHNOLOGY	I-106
6.26.03.A	LARGE CALIBER AND NUCLEAR TECHNOLOGY	I-111
6.26.17.A	SMALL CALIBER & FIRE CONTROL TECHNOLOGY	I-116
6.26.18.A	BALLISTICS TECHNOLOGY	I-120
6.26.22.A	CHEMICAL MUNITIONS AND CHEMICAL COMBAT SUPPORT	I-125
6.27.01.A	COMMUNICATION - ELECTRONICS	I-130
6.27.03.A	COMBAT SURVEILLANCE, TARGET ACQUISITION AND IDENTIFICATION	I-137
6.27.04.A	MILITARY ENVIRONMENTAL CRITERIA DEVELOPMENT	I-142
6.27.05.A	ELECTRONICS AND ELECTRON DEVICES	I-148
6.27.06.A	CHEMICAL BIOLOGICAL DEFENSE AND GENERAL INVESTIGATION	I-156

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

TECHNOLOGY BASE (Continued)

		PAGE NO.
6.27.07.A	MAPPING AND GEODSEY	I-160
6.27.09.A	NIGHT VISION INVESTIGATIONS	I-164
6.27.15.A	TACTICAL ELECTRONIC WARFARE TECHNOLOGY	I-168
A042	ELECTRONIC WARFARE TECHNOLOGY	I-173
6.27.16.A	HUMAN FACTORS ENGINEERING IN SYSTEMS DEVELOPMENT	I-177
6.27.17.A	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	I-180A
6.27.19.A	MOBILITY & WEAPONS EFFECTS TECHNOLOGY	I-184
6.27.20.A	ENVIRONMENTAL QUALITY TECHNOLOGY	I-189
6.27.22.A	MANPOWER, PERSONNEL AND TRAINING	I-194
6.27.23.A	CLOTHING, EQUIPMENT AND SHELTER TECHNOLOGY	I-198
6.27.24.A	JOINT SERVICES FOOD SYSTEM TECHNOLOGY	I-203
6.27.25.A	COMPUTER AND INFORMATION SCIENCES	I-207
6.27.26.A	ARMY SUPPORT OF THE DEFENSE ADVANCED RESEARCH PROJECT AGENCY (DARPA)	I-213
6.27.27.A	NON-SYSTEMS TRAINING DEVICES (NSTD) TECHNOLOGY	I-217
6.27.30.A	COLD REGIONS ENGINEERING TECHNOLOGY	I-222
6.27.31.A	MILITARY FACILITIES ENGINEERING TECHNOLOGY	I-227
6.27.32.A	REMOTELY PILOTED VEHICLES (RPV) SUPPORTING TECHNOLOGY	I-232
6.27.33.A	MOBILITY EQUIPMENT TECHNOLOGY	I-237
6.27.34.A	MEDICAL DEFENSE AGAINST CHEMICAL AGENTS	I-242
6.27.70.A	MILITARY INFECTIOUS DISEASE TECHNOLOGY	I-245
A802	MILITARY PREVENTIVE MEDICINE	I-250
6.27.71.A	MILITARY PSYCHIATRY AND MICROWAVE INJURY	I-254
6.27.72.A	RECOVERY FROM INJURY	I-258
6.27.73.A	HELICOPTER COMBAT CREW AND AIRBORNE MEDICINE	I-262
6.27.75.A	COMBAT MAXILLOFACIAL INJURY	I-266
6.27.76.A	MEDICAL DEFENSE AGAINST BIOLOGICAL AGENTS	I-270
6.27.77.A	MILITARY ENVIRONMENTAL STRESS	I-276
6.27.78.A	COMBAT MEDICAL MATERIEL	I-281
6.27.79.A	TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT TECHNOLOGY	I-284
6.27.80.A	MEDICAL SYSTEMS IN CHEMICAL DEFENSE	I-287
6.27.81.A	MILITARY ENERGY TECHNOLOGY	I-289
6.27.82.A	VERY HIGH SPEED INTEGRATED CIRCUITS	I-293
6.31.02.A	MATERIALS SCALE-UP	I-294
6.31.04.A	FUELS & EQUIPMENT	I-298

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

VOLUME I

TECHNOLOGY BASE (Continued)

		PAGE NO.
6.32.01.A	AIRCRAFT POWER PLANTS AND PROPULSION.	I-300
D447	DEMONSTRATOR ENGINES.	I-304
6.32.06.A	AIRCRAFT WEAPONS.	I-308
6.32.07.A	AIRCRAFT AVIONICS EQUIPMENT	I-312
6.32.09.A	AIR MOBILITY SUPPORT.	I-315
6.32.11.A	ROTARY WING CONTROLS, ROTORS, AND STRUCTURES.	I-319
6.32.16.A	SYNTHETIC FLIGHT SIMULATORS	I-324
6.32.18.A	AIRDROP EQUIPMENT AND TECHNIQUES.	I-328
6.33.06.A	TERMINAL HOMING SYSTEMS	I-332
6.33.13.A	MISSILE/ROCKET COMPONENTS	I-336
6.33.14.A	HIGHER ENERGY LASER (HEL) COMPONENTS.	I-341
6.36.02.A	ADVANCED LAND MOBILITY SYSTEM CONCEPTS.	I-348
D188	HIGH SURVIVABILITY TEST VEHICLE	I-352
6.36.06.A	LANDMINE WARFARE.	I-355
6.36.07.A	ARMY SMALL ARMS PROGRAM	I-359
6.36.13.A	ADVANCED FUZE DESIGN.	I-363
6.36.18.A	COUNTERMINE AND BARRIERS DEVELOPMENT.	I-367
6.36.21.A	COMBAT VEHICLE PROPULSION SYSTEMS	I-371
6.36.31.A	COMBAT VEHICLE TURRET & CHASSIS	I-375
6.37.02.A	ELECTRIC POWER SOURCES.	I-380
6.37.09.A	ADVANCED TECHNOLOGY DEMONSTRATION OF TMDE	I-384
6.37.10.A	NIGHT VISION ADVANCED DEVELOPMENT	I-388
DK70	NIGHT VISION ADVANCED DEVELOPMENT	I-393
6.37.25.A	REMOTELY PILOTED VEHICLES (RPV'S)/DRONES.	I-395
6.37.31.A	MANPOWER AND PERSONNEL.	I-400
6.37.32.A	COMBAT MEDICAL MATERIEL	I-404
6.37.39.A	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS	I-406
6.37.42.A	ADVANCED ELECTRONIC DEVICES	I-410
6.37.43.A	EDUCATION AND TRAINING.	I-415
6.37.44.A	TRAINING SIMULATION	I-419
6.37.48.A	ADVANCED DEVELOPMENT OF AUTOMATIC TEST EQUIPMENT AND SYSTEMS.	I-423
6.37.49.A	TECHNICAL VULNERABILITY REDUCTION	I-427
6.37.50.A	DRUG & VACCINE DEVELOPMENT.	I-432

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/TASK/TECHNICAL AREA

VOLUME II

STRATEGIC PROGRAMS		PAGE NO.
6.33.04.A	BALLISTIC MISSILE DEFENSE ADVANCED TECHNOLOGY	II-1
6.33.08.A	BALLISTIC MISSILE DEFENSE SYSTEMS TECHNOLOGY PROGRAM (BMDSTP)	II-6
6.37.35.A	WORLDWIDE MILITARY COMMAND AND CONTROL SYSTEM (WWMCCS) ARCHITECTURE	II-11
3.31.45.A	EUCOM COMMAND, CONTROL, AND COMMUNICATIONS SYSTEMS (EUCOM C^3 SYSTEMS)	II-15
TACTICAL PROGRAMS		
6.32.15.A	JOINT SURVIVABILITY INVESTIGATIONS	II-19
6.33.03.A	SURFACE-TO-SURFACE MISSILE ROCKET SYSTEMS	II-22
D564 *	AREA FIRE SUPPORT ROCKET - GENERAL SUPPORT ROCKET SYSTEM	II-28
6.33.20.A	ASSAULT BREAKER	II-35
6.36.04.A	NUCLEAR MUNITIONS AND RADIACS	II-40
6.36.08.A	WEAPONS & AMMUNITION	II-45
6.36.12.A	ANTITANK GUIDED MISSILE IMPROVEMENTS	II-49
6.36.15.A	LETHAL CHEMICAL MUNITIONS CONCEPTS	II-53
6.36.19.A	COUNTERMINE AND BARRIERS	II-57
6.36.23.A	LANDMINE SYSTEMS	II-60
6.36.24.A	MOBILITY	II-62
6.36.27.A	COMBAT SUPPORT MUNITIONS	II-65
6.36.28.A	FIELD ARTILLERY AMMUNITION DEVELOPMENT	II-69
D007	FIELD ARTILLERY AMMUNITION DEVELOPMENT	II-73
6.36.29.A	FIELD ARTILLERY CANNON SYSTEMS	II-75
6.36.32.A	ARMORED COMBAT SUPPORT VEHICLE FAMILY	II-79
6.37.05.A	PHYSICAL SECURITY	II-83
6.37.06.A	IDENTIFICATION FRIEND-OR-FOE (IFF) DEVELOPMENTS	II-88
6.37.07.A	COMMUNICATIONS DEVELOPMENT	II-93
6.37.11.A	AIRCRAFT ELECTRONIC WARFARE (EW) SELF-PROTECTION EQUIPMENT	II-98
6.37.12.A	MAPPING AND GEODESY	II-103
6.37.19.A	SPECIAL PURPOSE DETECTORS	II-107
6.37.21.A	CHEMICAL DEFENSIVE MATERIEL CONCEPTS	II-110

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/TASK/TECHNICAL AREA

VOLUME II

TACTICAL PROGRAMS (Continued)

		PAGE NO.
DE81	CHEMICAL DECONTAMINATION MATERIEL	II-114
6.37.22.A	TACTICAL OPERATIONS SYSTEM (TOS)	II-116
6.37.23.A	COMMAND AND CONTROL	II-122
6.37.26.A	COMBAT SUPPORT EQUIPMENT	II-127
6.37.30.A	TACTICAL SURVEILLANCE SYSTEM	II-131
6.37.37.A	ANTI-RADIATION MISSILE COUNTERMEASURES (ARM-CM)	II-134
6.37.40.A	SHORT RANGE AIR DEFENSE COMMAND AND CONTROL (SHORAD-C^2) SYSTEMS	II-138
6.37.45.A	TACTICAL ELECTRONIC WARFARE EQUIPMENT	II-144
D907	TACTICAL ELECTRONIC SURVEILLANCE SYSTEM	II-148
6.37.46.A *	SINGLE CHANNEL GROUND AND AIRBORNE RADIO SYSTEM (SINCGARS)	II-150
6.37.55.A	TACTICAL ELECTRONIC COUNTERMEASURES SYSTEMS	II-156
DK12	DIVISION TACTICAL ELECTRONIC COUNTERMEASURES SYSTEMS	II-161
6.42.01.A	AIRCRAFT AVIONICS	II-165
6.42.02.A	AIRCRAFT WEAPONS	II-169
6.42.03.A *	AERIAL SCOUT	II-173
6.42.04.A	AIR MOBILITY SUPPORT EQUIPMENT	II-178
6.42.07.A *	ADVANCED ATTACK HELICOPTER	II-182
6.42.12.A	COBRA/TOW	II-191
6.42.13.A *	CH-47 MODERNIZATION	II-195
6.42.17.A	SYNTHETIC FLIGHT TRAINING SYSTEMS	II-202
6.42.18.A	AIRDROP EQUIPMENT DEVELOPMENT	II-206
6.43.06.A *	STINGER	II-210
6.43.07.A	PATRIOT (SAM-D)	II-218
D212	PATRIOT (SAM-D)	II-224
6.43.08.A	PRECISION LASER DESIGNATOR	II-232
6.43.09.A *	ROLAND	II-236
6.43.10.A *	HELIBORNE MISSILE - HELLFIRE	II-245
6.43.11.A *	PERSHING II	II-255
6.43.13.A	GRASS BLADE	II-263
6.43.16.A *	FIRE AND FORGET HELLFIRE	II-265
6.43.18.A *	DIVISION AIR DEFENSE (DIVAD) GUN	II-271

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/TASK/TECHNICAL AREA

VOLUME II

TACTICAL PROGRAMS (Continued)

		PAGE NO.
6.46.01.A	INFANTRY SUPPORT WEAPONS	II-279
6.46.02.A	WEAPONS AND AMMUNITION	II-285
6.46.03.A	NUCLEAR MUNITIONS	II-290
D385	IMPROVED 155MM NUCLEAR PROJECTILE	II-296
6.46.05.A	FIELD ARTILLERY WEAPONS AND AMMUNITION, 105MM	II-301
6.46.06.A	EXPLOSIVE DEMOLITIONS	II-305
6.46.08.A	ARMY SMALL ARMS PROGRAM	II-309
6.46.09.A	COMBAT SUPPORT SYSTEMS	II-313
6.46.12.A	COUNTERMINE AND BARRIERS	II-317
6.46.14.A	FIELD ARTILLERY WEAPONS AND AMMUNITION, 155MM	II-322
D373	AMMUNITION, CANNON, 155MM	II-326
6.46.16.A *	INFANTRY FIGHTING VEHICLE (IFV) XM2	II-329
6.46.17.A *	VEHICLE RAPID FIRE WEAPON SYSTEM (VRFWS) - (BUSHMASTER)	II-338
6.46.19.A	LANDMINE WARFARE	II-346
D088	MODULAR PACK MINE SYSTEM	II-351
6.46.20.A *	TANK SYSTEMS	II-354
6.46.21.A *	COPPERHEAD (CANNON LAUNCHED GUIDED PROJECTILE)	II-362
6.46.23.A	IMPROVED LIGHT ANTITANK WEAPON (VIPER)	II-369
6.46.24.A	HIGH MOBILITY WEAPONS CARRIER	II-373
6.46.26.A	FORWARD OBSERVER VEHICLE	II-377
6.46.28.A	INDIRECT FIRE TRAINING MUNITIONS	II-381
6.46.29.A *	CAVALRY FIGHTING VEHICLE (CFV) XM3	II-385
6.46.30.A	TANK GUN COOPERATIVE DEVELOPMENT	II-393
D064	120MM TANK GUN AMMO DEVELOPMENT	II-398
D287	TANK GUN INTEGRATION	II-402

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

VOLUME III

TACTICAL PROGRAMS		PAGE NO.
6.47.01.A	COMMUNICATIONS ENGINEERING DEVELOPMENT	III-1
6.47.04.A	UNATTENDED GROUND SENSORS (UGS)	III-7
6.47.06.A	RADIOLOGICAL DEFENSE EQUIPMENT	III-11
6.47.09.A	IDENTIFICATION FRIEND OR FOE (IFF) EQUIPMENT	III-15
6.47.10.A	NIGHT VISION DEVICES	III-19
6.47.11.A	AIRCRAFT ELECTRONIC WARFARE (EW) SELF-PROTECTION SYSTEMS	III-23
D665	SPECIAL ELECTRONIC MISSION AIRCRAFT SURVIVABILITY SYSTEMS	III-28
6.47.12.A	TACTICAL DATA SYSTEM INTEROPERABILITY	III-31
6.47.14.A	TACTICAL ELECTRIC POWER SOURCES	III-36
6.47.16.A	MAPPING AND GEODESY	III-40
6.47.17.A	GENERAL COMBAT SUPPORT	III-45
6.47.18.A	PHYSICAL SECURITY	III-50
6.47.23.A	SPECIAL PURPOSE DETECTORS	III-55
6.47.24.A	BIOLOGICAL DEFENSE MATERIAL	III-58
6.47.25.A	CHEMICAL DEFENSE MATERIEL	III-61
D023	COLLECTIVE PROTECTION MATERIEL - ARMORED VEHICLES	III-66
6.47.27.A	COMMAND AND CONTROL	III-68
DC98	POSITION LOCATION REPORTING SYSTEM (PLRS)	III-75
6.47.28.A	FAMILY OF MILITARY ENGINEER CONSTRUCTION EQUIPMENT (FAMECE)	III-79
6.47.29.A	COUNTERMORTAR RADAR (AN/TPQ-36)	III-82
6.47.30.A	REMOTELY PILOTED VEHICLES (RPVs)	III-87
6.47.31.A *	COUNTERBATTERY RADAR (AN/TPQ-37)	III-91
6.47.40.A	TACTICAL SURVEILLANCE SYSTEM	III-99
6.47.45.A	TACTICAL ELECTRONIC WARFARE SYSTEMS	III-102
D906	DIVISION TACTICAL ELECTRONIC SUPPORT MEASURES SYSTEMS	III-106
D909	TACTICAL ELECTRONIC SURVEILLANCE SYSTEM	III-109
6.47.48.A *	STANDOFF TARGET ACQUISITION SYSTEM (SOTAS)	III-112
6.47.50.A	TACTICAL ELECTRONIC COUNTERMEASURES SYSTEMS	III-121
DL12	DIVISION TACTICAL ELECTRONIC COUNTERMEASURES SYSTEMS	III-125
6.47.78.A	NAVSTAR GLOBAL POSITIONING SYSTEM (GPS) USER EQUIPMENT	III-128
6.47.79.A	JOINT INTEROPERABILITY OF TACTICAL COMMAND AND CONTROL SYSTEMS (JINTACCS)	III-132
D309	JOINT INTEROPERABILITY OF TACTICAL COMMAND AND CONTROL SYSTEMS (ARMY)	III-137
D310	JOINT INTEROPERABILITY OF TACTICAL COMMAND AND CONTROL SYSTEMS (EXECUTIVE AGENT)	III-144
6.57.10.A	JOINT CHEMICAL/BIOLOGICAL CONTACT POINT AND TEST	III-148

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

VOLUME III

TACTICAL PROGRAMS (Continued)		PAGE NO.
6.57.13.A	BATTLEFIELD SYSTEMS INTEGRATION	III-152
2.37.24.A *	HEAVY ANTITANK/ASSAULT WEAPON SYSTEM (TOW)	III-155
2.37.30.A *	CHAPARRAL	III-164
2.37.31.A *	SURFACE-TO-AIR MISSILE HAWK/HAWK IMPROVEMENT PROGRAM (SAM HAWK/HIP)	III-176
2.37.33.A *	IMPROVED NONNUCLEAR LANCE WARHEAD SECTION	III-185
2.37.35.A	M60A1 TANK PRODUCT IMPROVEMENT PROGRAM	III-193
2.80.10.A	JOINT TACTICAL COMMUNICATIONS PROGRAM (TRI-TAC)	III-198
D104	JOINT TACTICAL COMMUNICATIONS (TRI-TAC) OFFICE	III-205
D119	MODULAR RECORD TRAFFIC TERMINAL (MRTT)	III-210
D222 *	AUTOMATIC COMMUNICATIONS CENTRAL OFFICE, AN/TTC-39	III-213
INTELLIGENCE AND COMMUNICATION		
3.31.11.A	STRATEGIC COMMUNICATIONS (STARCOM)	III-221
3.31.26.A	*LONG HAUL COMMUNICATION (DCS)*	III-224
3.31.42.A	SATELLITE COMMUNICATIONS GROUND ENVIRONMENT	III-228
D253	DEFENSE SATELLITE COMMUNICATIONS SYSTEM-DEFENSE COMMUNICATION SYSTEM (PHASE II)	III-234
D456	TACTICAL SATELLITE COMMUNICATION SYSTEMS	III-238
3.34.01.A	COMMUNICATIONS SECURITY (COMSEC) EQUIPMENT	III-241
DEFENSEWIDE MISSION SUPPORT		
6.33.15.A	TARGET MISSILES	III-245
6.37.18.A	ELECTRONIC WARFARE VULNERABILITY/SUSCEPTIBILITY	III-250
D267	MISSILE VULNERABILITY/SUSCEPTIBILITY	III-256
6.37.38.A	NONSYSTEMS TRAINING DEVICES (NSTD) DEVELOPMENT	III-260
A224	NSTD ARMOR/ANTIARMOR	III-266
6.37.47.A	SOLDIER SUPPORT/SURVIVABILITY	III-269
6.47.13.A	COMBAT FEEDING, CLOTHING, AND EQUIPMENT	III-273
6.47.15.A	NON-SYSTEMS TRAINING DEVICES (NSTD) ENGINEERING	III-277
6.47.26.A	METEOROLOGICAL EQUIPMENT AND SYSTEMS	III-284
6.51.02.A	US ARMY TRAINING AND DOCTRINE COMMAND (TRADOC) STUDIES AND ANALYSES	III-288
6.52.01.A	AVIATION ENGINEERING FLIGHT ACTIVITY	III-291
6.53.01.A	KWAJALEIN MISSILE RANGE	III-294

BUDGET ACTIVITY
PROGRAM ELEMENT
PROJECT/SCIENTIFIC AREA/TECHNICAL AREA

VOLUME III

DEFENSEWIDE MISSION SUPPORT (Continued)

		PAGE NO.
6.57.02.A	SUPPORT OF DEVELOPMENT TESTING	III-299
D618	AIRCRAFT DEVELOPMENT TEST ACTIVITY	III-306
6.57.06.A	MATERIEL SYSTEMS ANALYSIS	III-308
6.57.07.A	US ARMY TRAINING AND DOCTRINE COMMAND (TRADOC) OPERATIONAL TESTING	III-312
DV02	TEST BOARDS	III-317
DV03	INITIAL OPERATIONAL TEST AND EVALUATION (IOTE)	III-320
D986	SUPPORT EQUIPMENT	III-323
6.57.08.A	THEATER NUCLEAR FORCE SURVIVABILITY (TNF/S) ANALYSIS	III-326
6.57.09.A	EXPLOITATION OF FOREIGN ITEMS	III-329
6.57.12.A	US ARMY OPERATIONAL TEST AND EVALUATION AGENCY (OTEA) OPERATIONAL TESTING	III-333
6.58.01.A	PROGRAMWIDE ACTIVITIES	III-337
MM88-01	COMMAND HEADQUARTERS SUPPORT	III-341
MM88-03	SPECIAL PURPOSE AND AUTOMATIC DATA PROCESSING EQUIPMENT	III-343
6.58.02.A	INTERNATIONAL COOPERATIVE RESEARCH AND DEVELOPMENT	III-345
6.58.03.A	TECHNICAL INFORMATION ACTIVITIES	III-348
6.58.04.A	US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND (DARCOM) RANGES/TEST FACILITIES	III-352
DE90	YUMA PROVING GROUND	III-357
DE91	ABERDEEN PROVING GROUND (MATERIEL TEST DIRECTORATE)	III-360
DE92	DUGWAY PROVING GROUND	III-363
DE93	WHITE SANDS MISSILE RANGE	III-366
DE94	ARMY ELECTRONIC PROVING GROUND	III-369
6.58.05.A	DOD MUNITIONS EFFECTIVENESS AND EXPLOSIVE SAFETY	III-372
6.58.98.A	ARMY MANAGEMENT HEADQUARTERS ACTIVITIES	III-377

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.04.A
DOD Mission Area: #321-Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3-Strategic Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	107297	113510	113668	127509	Continuing	Not Applicable
D215	BALLISTIC MISSILE DEFENSE ADVANCED TECHNOLOGY						

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Ballistic Missile Defense (BMD) Advanced Technology Program is a vigorous research and development effort designed to exploit new and emerging technologies - seeking better and less costly ways to perform the ballistic missile defense. The U.S. is faced with the possible loss, by the mid-1980's, of its strategic supremacy over the Soviet Union; specifically, there is a growing Soviet threat to our strategic deterrent force. Further, the U.S. must be conscious of the dangers of nuclear proliferation and the possible value in years to come of national options to protect the country from accidental or unauthorized launches or the threat of attack by an Nth Country. Every possible alternative and combination should be considered to maximize the level of national survival and retaliatory capability.

C. BASIS FOR FY 1980 REQUEST: The budget request for the BMD Advanced Technology Program is designed to maintain the pace of BMD advanced development needed to sustain the national technological lead and to aggressively search for and exploit innovative new concepts as a guard against technological surprise. The program will continue to emphasize experimentation on futuristic concepts which extend our technological bounds and have the potential of providing fundamentally new approaches to ballistic missile defense. The broad scope of the advanced technology program and the intrinsic complexity of such developments call for significant efforts in each technology - radar, optics, interceptors, discrimination and data processing to allow hardware development and field experiments to validate laboratory and study results. Major milestones anticipated in FY 80 include major improvements in optical sensors and enhanced capability to detect, discriminate, and track threatening vehicles; the development of distributed micro-processors to handle complex BMD problems; and development of the capability to defend against nuclear ballistic missiles without employing nuclear interceptors.

Program Element: #6.33.04.A
DOD Mission Area: #321-Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3-Strategic Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	107297	113510	120855	Continuing	Not Applicable

The $7187 decrease in the FY 1980 estimate is due to Secretary of Defense decision to reduce funding of strategic programs.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.33.04.A
DOD Mission Area: #321-Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3-Strategic Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The BMD Advanced Technology Program is a vigorous, broad research effort on the technology of all BMD components and functions including reentry phenomenology, advanced discrimination techniques, computer technology in a BMD application, advanced interceptor missiles, optical and radar sensors and the continuing assessment of new technologies. The objectives of this program are to: provide the advanced technological foundation for future BMD systems concepts, emphasizing approaches which could yield fundamental breakthroughs in BMD capability; provide the technological basis for substantial improvements in nearer-term BMD systems; avoid technological surprise by Soviet BMD developments; and assist in the design and evaluation of U.S. strategic offensive systems by continuing exchange of information on their penetration capability and by technological assessments of future Soviet BMD capability. The U.S. BMD Advanced Technology Program has, in recent years, placed increasing emphasis upon exoatmospheric technologies to augment terminal defense elements and technological upgrading of terminal defense technology which includes homing non-nuclear kill interceptors and distributed defense components.

G. RELATED ACTIVITIES: The BMD Advanced Technology Program is fully coordinated with related programs being sponsored by the Air Force, the Navy, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), Department of Energy (DOE), and other Army commands and laboratories. These programs include laser developments, high energy beam technologies, electronic component developments, warhead developments and evaluations of potential foreign offensive missile and BMD deployments.

H. WORK PERFORMED BY: The five major contractors currently are: Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, MA; the Boeing Company, Seattle, WA; Martin Marietta Corporation, Orlando, FL; McDonnel Douglas Corporation, Huntington Beach, CA; and the System Development Corporation, Huntsville, AL. There will be approximately one-hundred additional contractors and other government agencies for an additional estimated dollar value of $80 million. The developing organization responsible for the program is the Ballistic Missile Defense Advanced Technology Center, Huntsville, AL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 78 and Prior Accomplishments: Demonstrated the technology to intercept maneuvering vehicles through an advanced terminal interceptor program. Demonstrated technology for defense of MINUTEMAN which is now designated as the Systems Technology Program (STP). Major technology elements included the use of large, high-powered commercial data processors, small netted radars, an improved interceptor missile, and new discrimination techniques. Pursued the development of a technology base which offers the potential of non-nuclear kill (NNK) devices in ballistic missile defense. High technology engagement constructs in both the endo and exoatmospheric regimes have been synthesized based upon the emergence of LWIR optical sensors, the success of the fly along infrared (FAIR) flight experiments, homing intercept technology (HIT) guidance and control technology, non-nuclear kill technology, and micro-data processing technology. Completed and demonstrated an electro-optical signal processor for BMD applications. Completed the design of a modular missile-borne computer that is capable of performing a multiplicity of data processing functions on board the vehicle. Initiated the assessment of high energy beam technology for BMD applications.

Program Element: #6.33.04.A
DOD Mission Area: #321-Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3-Strategic Programs

2. FY 79 Program: The FY 79 BMD Advanced Technology Program is designed to continue advancements of the state-of-the-art in BMD radars, data processing and interceptors while actively seeking and investigating new componentry and techniques which offer a potential for revolutionizing ballistic missile defense. Emphasis in exoatmospheric optical discrimination, designation and tracking; passive and active (laser) optical signature data collection; non-nuclear kill technology (warhead and fuzing); endo-atmospheric homing technology; and laser/millimeter wavelength technology in FY 79 will allow technical assessment of the feasibility of using missile-borne or ground-based optical sensors to overcome many of the limitations of ground-based radars. Significant improvements in target location, guidance and control, fuzing accuracy and fragmentation warhead capability could result in the elimination of the requirement for nuclear warheads and thus result in highly responive, less costly BMD systems. Rapidly deployable concepts utilizing novel kill mechanisms will be evaluated in FY 79. A millimeter wave radar test facility program will be initiated. The high energy beam technology program will be continued at a moderatate level to insure orderly development of the state-of-the-art in this technology.

3. FY 80 Planned Program: The FY 80 program is structured to address each BMD technology area in the context of overall program objectives. The Radar Program will continue to be a broadly-based technology effort covering the major frequency regimes (microwave, millimeter, and micrometer) and stressing cost reduction, rapid deployment, component hardening, and improved information gathering. Emphasis will be placed on the development of the millimeter wave radar initiated in FY 79. The Optics Technology Program will provide for the continued development of mosaic sensor technology, evaluation of lasers as BMD weapons, and exploration of promising advanced optical concepts and techniques. The Discrimination Technology Program will emphasize the experimental acquisition and analysis of millimeter wavelength radar data and optical sensor data useful in development of detection and discrimination techniques, and schemes for the use of a combination of sensors in the terminal regime. In the Data Processing Program, a laboratory prototype of the modular missile-borne computer will be delivered to the Advanced Research Center for completion of software development and initiation of interactive testing in a simulated operational environment. The critical research issues for distributed data procession in a BMD scenario will be emphasized to provide high performance configurations and computer architecture for BMD systems. In the Interceptor Program, critical component testing will be completed and large-scale fabrication of the electronics, controls and warhead and structural subsystems initiated. Large scale motor tests of a very high performance propulsion subsystem will be completed. An improved design HIT interceptor will incorporate nuclear hardness techniques, and new sensor and propellant technologies. Evaluation of strategic options from a defense viewpoint will be continued.

4. FY 1981 Planned Program: The Radar Technology Program will include completion of the hardened frequency scanned antenna program, a prototype 35 gigahertz high-power tube, and a 250 megahertz signal processor. Efforts will continue on laser beam agility, homing and fuzing, and the development and testing of a millimeter wave radar. The Optics Technology programs will include evaluation of optical mosaic exoatmospheric sensors, and further investigation of the feasibility of applying high-energy lasers (HEL) as BMD weapons. The Discrimination Technology Program will emphasize the acquisition and analysis of field test data for representative threat vehicles and penetration aids. Primary emphasis will be on the acquisition of data in the optical and millimeter wavelength regimes. In the Data Processing Program, a prototype modular missile-borne computer with operational software will be demonstrated. Distributed data processing design technology, high performance computer architectures, real-time

distributed algorithms, emulation technology, distributed system drivers, and BMD constructs will be integrated together to initiate BMD case study demonstrations. The Interceptor Technology Program will validate a high confidence technology base for the endo non-nuclear kill, millimeter wave homing interceptor. An improved impact homing interceptor prototype will be fabricated and subjected to integrated system ground tests to validate the guidance/avionics/liquid propulsion subsystems' interactions. The capability to fabricate a flightweight liquid propulsion impact homing vehicle for incorporation into the Homing Overlay Experiment (HOE) flight program will be assessed. Efforts will continue to use advanced state-of-the-art technology to achieve rapidly deployable low-cost BMD.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.08.A

Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)

DoD Mission Area: #321 - Ballistic Missile Defense

Budget Activity: #3 - Strategic Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	106188	114000	114784	128090	Continuing	Not Applicable
	BMD SYSTEMS TECHNOLOGY PROGRAM	106188	114000	114784	128090	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for BMD systems technology research and development activities which will advance BMD systems state-of-the-art technology; maintain a minimum capability to initiate design/development of a deployable BMD system, if directed; and conduct systems definition studies and testing of selected components in a systems context to assess responsiveness to a variety of BMD missions.

C. BASIS FOR FY 1980 RDTE REQUEST: The underlay portion of the layered defense system will be updated with new software programs and state-of-the-art componentry. The System Technology Test Facility at Kwajalein Missile Range will continue to gather bulk filtering and discrimination data on dedicated intercontinental ballistic missile targets and targets of opportunity to validate critical systems and issues. System studies will continue to define system constraints and parameters for the forward acquisition sensors. Low Altitude Defense (LoAD) studies and analysis for the defense of MX will continue. Design, development, and testing of the interceptor will be initiated for the exoatmospheric homing overlay experiment concentrating on flight tests in FY The coordinated test procedures for this experiment will be developed and facilities at KMR will be prepared for support of these flight tests.

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #321-Ballistic Missile Defense Budget Activity: #3-Strategic Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
1st Homing and Kill Interceptor Flight		
Complete Terminal Validation Effort		

A change in priorities resulted in 15 million dollars reprogrammed in FY 79 for accelerating by 2 months Homing and Kill Interceptor flight schedule.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	106188	114000	120840	Continuing	Not Applicable

Difference between FY 79 projection of FY 80 funding request and this request for FY 80 funding is due to cuts by the Secretary of Defense in various strategic programs.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #321-Ballistic Missile Defense Budget Activity: #3-Strategic Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Site Defense Program was initiated in FY 1971 to conduct prototype demonstrations of defensive systems for MINUTEMAN or other high value targets against Soviet ballistic missile improvements which were becoming a threat to the US MINUTEMAN force. FY 1975 and FY 1976 Congressional Budget authorization hearings directed reorientation of the Site Defense Program from prototype demonstration to systems technology advancement and redesignated the program as the Ballistic Missile Defense Systems Technology Program. The prime objective of the reoriented program was to provide, if required, for the full scale development of ballistic missile defense systems which incorporate the most advanced technology with acceptable lead time and cost. The Systems Technology Program investigates systems capable of defending a variety of national strategic targets with primary emphasis on defense of MINUTEMAN. This program is in consonance with the US Strategic Arms Limitation Agreement plans, the US strategic offensive nuclear arms research and development community, and the US ballistic missile intelligence community. The Ballistic Missile Defense Program insures that the US will be capable, if and when needed, or providing a defense against an attack by land-based or submarine launched ballistic missiles.

G. RELATED ACTIVITIES: Related activities include testing at the Kwajalein Missile Range, Program Element 6.53.01.A; and the Ballistic Missile Defense Advanced Technology Program, Program Element 6.33.04.A. The Ballistic Missile Defense Advanced Technology program conducts basic and applied research into natural phenomena to develop the state-of-the-art technology which the System Technology Program incorporates into system designs. Kwajalein Missile Range provides the support facilities for test and evaluation of the Ballistic Missile Defense Systems Technology Program.

H. WORK PERFORMED BY: Contractors: The major contractors are: McDonnell Douglas Astronautics Company, Huntington Beach, CA; TRW, Inc., Redondo Beach, CA; General Electric Company, Syracuse, NY; Lockheed Missiles and Space Co., Sunnyvale, CA; Honeywell, Inc., Avionics Division, St. Petersburgh, FL; Honeywell, Inc., Defense Electronics Div., Lexington, MA; Rockwell International, Rocketdyne Div, Conoga Park, CA; Martin Marietta Corporation, Orlando, FL; and Teledyne Brown Engineering Co., Inc., Huntsville, AL. Government: U.S. Army Ballistic Missile Defense Systems Command, Huntsville, AL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishment: In 1975, the program was restructured from prototype demonstration to validation of key issues. The Terminal Validation program at the System Technology Test Facility (STTF) continued with emphasis in the areas of data processing and the advanced digital signal processor (ADSP). Analysis for defending a variety of strategic national assets was continuously evaluated. Design and development of hardware for initial bulk filter and discrimination test was completed. Technical studies were conducted on the layered defense system constructs. The overlay defensive system definition studies were completed with selection of an interceptor supplier and integration contractor (ISIC) and initial development work was started for the Homing Overlay Experiment in August 1978.

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #321-Ballistic Missile Defense Budget Activity: #3-Strategic Programs

2. FY 1979 Program: The Terminal Validation Program at the Systems Technology Test Facility (STTF) is scheduled for completion by end of FY 79. Bulk filter and discrimination data will be gathered on two dedicated MINUTEMAN targets and numerous targets-of-opportunity using the full precommit software capability. Integration testing of the advanced digital signal processor (ADSP) will be conducted at the contractor's plant. Design and testing of advanced data processing hardware configurations will continue in addition to development of the STTF software and modification upgrades. Selected hardware modifications and modified software will be incorporated into the STTF following completion of the terminal validation program. System analysis and preliminary design efforts will be conducted on the layered defense concept, low altitude defense, and forward acquisition sensor program. BMD systems studies and analyses will continue at approximately the same level of effort as in FY 78. Design definition for the homing overlay experiment (HOE) will continue with major emphasis on design and development of a long wave length infrared (LWIR) sensor, and selection of a non-nuclear warhead. Detailed design and initial fabrication of test hardware and software are scheduled for the Homing Overlay Experiment. HOE design and development efforts will be scheduled to permit initial flight tests to

3. FY 1980 Planned Program: Major effort will be directed toward the design and fabrication of the homing overlay experiment hardware. Component ground testing will start in the various subcontractor's plants. Seven major subcontractors will be involved in development of the infrared sensor, warhead, propulsion system, guidance system, ground support equipment and electronic control systems. Construction of required test facilities at Kwajalein Missile Range will begin in third quarter of FY 80. Design verification ground testing will begin by mid FY 80 and continue throughout the fiscal year. The first complete interceptor ground test unit will be completed early in the fiscal year; experimental planning and definition will continue through the fiscal year; hardware testing augmented by system simulation will be performed; fabrication of the first interceptor flight test hardware for the HOE Program will begin. Advanced data processing hardware configuration experiments will continue and the detailed design of a facility to support the development of tactical distributed data processing software will be initiated. System analysis of the layered defense concept will continue to identify constraints and define parameters for an integrated concept. CONUS testing of the ADSP will be completed.

4. FY 1981 Planned Program: The various ground testing activities of the experimental hardware and complete fabrication of the flight test units for the first phase of the Homing Overlay Experiment (HOE) will be accomplished. Construction of test facility at KMR will be completed for the first (HOE) flight test Comprehensive studies aimed at resolving further system constraints and defining the system parameters will continue. The Systems Technology Test Facility (STTF) will be continually updated with the latest technology and used to support on-going experiments. Bulk filter and discrimination data on two dedicated intercontinental ballistic missiles and other targets of opportunity will be obtained. Evaluation of the advanced data processor subsystem will be conducted and design of the software support will continue.

5. Program to Completion: This is a continuing program. However, the issues will be validated for the homing and kill (H&K) portion, and the detection, designation, and discrimination (D^3) portion of the homing overlay experiment. The System Technology Test Facility will be used to gather operational type data on dedicated targets and targets of opportunity to assess the system's capability to bulk filter tank particles, discriminate in real time and to establish hardware and software functional capability limits. The low altitude experiment will be continued to validate the technical issues associated with this program. The forward acquisition sensor program will be conducted to validate technical issues and decrease subsequent engineering development risks. Efforts will continue, to design total system concepts and to define and integrate battle-management and command, communication, and control functions.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.35.A

Title: Worldwide Military Command and Control System (WWMCCS) Architecture

DoD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #8 - Strategic Programs

A. RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2456	700	811	750	0	5195
DH 50	WWMCCS Architecture	2456	700	811	750	0	5195

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This advanced development program is in support of the Army's portion of the WWMCCS Architecture, directed to be accomplished by the Deputy Secretary of Defense. This effort consists of studies and analyses in the development, simulation, planning, and evaluation of equipment and techniques to define a total Army command and control system configuration. The Army currently has no single guidance document addressing command and control requirements for developing and fielding systems in the 1980's and beyond. The objective of this effort is to develop a single coherent policy guidance document for the transition of existing tactical and strategic command, and control systems to those that will be required in the 1980's and beyond. This document will present a comprehensive, cost effective command and control program which will result in substantial cost savings by establishing a balanced capability to satisfy system requirements. This approach allows maximum use of off the shelf procurement and minimizes RDTE expenditures. Overall effort relates to, and will interface with, current initiatives underway with the WWMCCS Selected Architecture, European Command, Control, and Communications Study, US Army Europe (USAREUR) Command and Control Information Study, and specific North Atlantic Treaty Organization (NATO) command and control initiatives.

C. BASIS FOR FY 1980 RDTE REQUEST: The FY 1980 RDTE effort will involve residual contractor support for the Army Command and Control Master Plan (AC^2MP) which will be published in September 1979. FY 1980 efforts will include AC^2MP updating and system engineering functions such as the assessment of tactical and strategic requirements and the evaluation of equipment presently in the field, as well as those programed for deployment, to determine their ability to meet command, control, and communications requirements. The FY 1980 effort will incorporate into the AC^2MP changes in engineering and concepts based on continuing studies and analyses in related areas.

Program Element: #6.37.35.A

Title: Worldwide Military Command and Control System (WWMCCS) Architecture

DoD Mission Area: #331 - Strategic Command, Control and Communications (C^3)

Budget Activity: #3 - Strategic Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army Command and Control System (ACCS)	Oct 1977	Oct 1977
Theater Nuclear Architecture	Jun 1978	Feb 1978
ACCS Theater Conventional Architecture	Apr 1979	Feb 1978
Crisis Situation Architecture	Dec 1978	Jul 1978
Post-Attack Architecture	Dec 1978	Jul 1978
ACCS Architecture Alternatives	Aug 1979	Jul 1978
ACCS Master Plan	Sep 1979	-

Approval by the Assistant Secretary of the Army (Research and Development) of a Request for Approval of Additional Contractual Support (RACS) for the Army Command and Control Master Plan permitted an expansion of the scope of the AC^2MP effort to provide increased US Army Training and Doctrine Command (TRADOC) involvement and a higher degree of detail in the analysis. An amended statement of work permitted the adjusted document delivery dates from the contractor indicated in Current Milestone Dates above.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	556	700	811	Continuing	Not Applicable

An additional $1.9 million was reprogramed to this program in April 1978 for additional technical support from the contractor in accordance with Amendment No. 2 to Statement of Work (see paragraph C above). This was done to develop the tactical portion of the AC^2MP. This reprograming was approved by the Army Command and Control Council and documented by a Request for Additional Contractual Support (RACS) to the Assistant Secretary of the Army.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.35.A

Title: Worldwide Military Command and Control System (WWMCCS) Architecture

DoD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Army was tasked by the Office of the Secretary of Defense, Telecommunications, and Command, and Control, on 14 March 1976 to undertake its own Architectural Study to assess all elements of the Army which contribute to force command and control, and to define future Army command, control, and communications requirements. The effort is designed to address the interface requirements between WWMCCS and the Army's strategic and tactical command, and control systems. The program evaluates the techniques and equipment required to enhance the survivability, interoperability, reliability, flexibility, security, and overall integration of command and control elements.

G. RELATED ACTIVITIES: Results from Program Element 3.31.45.A, EVCOM Command, Control, and Communications Systems, study effort are used as input data to this program. Additionally, efforts of Program Element 3.20.53.A, National Military Command Systemwide Support are related. Each of these studies addresses a different portion of the command, control, and communications environment.

H. WORK PERFORMED BY: The International Business Machine (IBM) Corporation, Federal Systems Division, Arlington, VA, is the contractor for the Army Command and Control Master Plan. The Director, Requirements, Deputy Chief of Staff for Operations and Plans (DCSOPS), Department of the Army, is the Program Manager. The Air Force Systems Command, through its Electronic Systems Division at L.G. Hanscom Air Force Base, MA, is responsible for contract administration.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Army Command and Control Master Plan commenced in June 1976 under Program Element 6.51.01.A, Studies and Analyses. The contractor provided a detailed work plan which described the flow of the efforts necessary to achieve an architecture and a plan for its subsequent implementation. In FY 1977 and 1978, under Program Element 6.37.35.A, Situation/Action/Mission documents were prepared in order to define courses of action available for each strategic mode and to derive information and performance requirements. In FY 1978, baseline assessment documents were prepared for the theater nuclear war level of conflict to evaluate command and control systems which will be available in the 1980's time frame. In FY 1978, analysis of the theater nuclear war level of conflict was completed and architectural alternatives documents, with requirements and solution annexes, were published.

2. FY 1979 Program: The 1978 effort on the crisis situations, post attack-reconstitution, and conventional architecture will be continued. In November 1978, a Pilot Master Plan was published in order to obtain Army agreement on master plan format and level of detail, and to surface implementation issues for early resolution. In FY 1979, analysis of the conventional war, crisis, and general nuclear war/post attack levels of conflict will be completed and architectural alternatives documents, with requirements and solutions annexes, will be published. The effort will culminate with the publication of the Army Command and Control Master Plan in September 1979.

Program Element: #6.37.35.A

Title: Worldwide Military Command and Control System (WWMCCS) Architecture

DoD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

3. FY 1980 Planned Program: This effort will finalize the initiations of the Army Command and Control Master Plan and recommend an implementation strategy. Residual contractor support will be required following publication of the Army Command and Control Master Plan. Tactical and strategic requirements will be assessed and the plan updated as equipments, both in the field and programed for deployment, are evaluated to determine their ability to meet command, control, and communications requirements. The effort will incorporate into the plan changes in engineering and concepts based on continuing studies and analyses in related areas.

4. FY 1981 Planned Program: Findings and recommendations derived from the completed Army Command and Control Master Plan will continue to be evaluated to determine capability of existing requirements to meet requirements.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #3.31.45.A

TITLE: EUCOM Command, Control, and Communications Systems (EUCOM C^3 Systems)

DOD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT						
DH58	EUCOM C^3 Systems						

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports a continuing study effort in response to the Deputy Secretary of Defense tasking for Army to examine the entire Command, Control, and Communications structure in Europe and propose options for improvement. Effort also includes planning for the

and the analysis of the European portion of the command and control requirements of the Army Command and Control Master Plan (AC^2MP). A Joint Chief of Staff (JCS) study was initiated in 1974 on the C^3 picture in Europe. This study identified 96 C^3 deficiencies requiring research, development and acquisition initiatives. This effort will analyze each deficiency and recommend the most cost-effective means of improving the European C^3 posture. Specifically, the plan will address inadequate interoperability with NATO systems, limited C^3 survivability during crisis, and requirements for hardened C^3 facilities.

C. BASIS FOR FY 1980 RDTE REQUEST: Continuation of FY 1979 effort to analyze C^3 deficiencies, develop plans for and continue development of plans required to improve survivability, vulnerability, and interoperability of the command, control and communications (C^3) facilities in Europe. Major effort will be to finalize study results and produce a comprehensive transition plan for proceeding to an orderly procurement program.

Program Element: #3.31.45.A

TITLE: EUCOM Command, Control, and Communications Systems (EUCOM C^3 Systems)

DOD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE	-	-	-	-	-
Funds (as shown in FY 1979 submission)	-	-	-	-	-

The reduction shown for FY 1980 of $1150 thousand from the FY 1979 submission is due to the anticipated completion of major study efforts of this program in FY 1979. Remaining funds are to close out this effort and produce a comprehensive transition phase for proceeding to an orderly procurement program. Results will also be reflected in the Army Command and Control Master Plan (AC^{2}MP). Increase in FY 1978 funding level above FY 1979 submission is due to a requirement to accelerate portions of the US study to coincide with the Project 85 schedule.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:						
Funds (current requirements)	0	0	0			
Funds (as shown in FY 1979 submission)	0	0	0	-		
Quantities (current requirements)						
Quantities (as shown in FY 1979 submission)						
Military Construction, Army:						
Funds (current requirements)	0	0	0			
Funds (as shown in FY 1979 submission)	0	0	0			

* Number of various items of equipment.

Program Element: #3.31.45.A

TITLE: EUCOM Command, Control, and Communications Systems (EUCOM C^3 Systems)

DOD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Deputy Secretary of Defense Memorandum, 14 March 1974, directed the Joint Chiefs of Staff (JCS), with the Army as Executive Agent, to examine the entire Command, Control, and Communications (C^3) picture in Europe and to propose options for improvement. The study was initiated in April 1974 and a final report, identifying deficiencies requiring research, development, and acquisition initiatives, was submitted to JCS in August 1975. The JCS completed their review in February 1976 and submitted their comments to the Secretary of Defense (SECDEF). Since then, the report and its 96 recommendations has served as a baseline for actions undertaken to improve the many aspects of European C^3. As a related action, Deputy Secretary of Defense Memorandum, 24 June 1976, directed the Secretary of the Army to plan for the

as well as communications and Automatic Data Processing (ADP) equipment/ procedures that meet common survivability and interoperability criteria. Tasks accomplished under this program are essential in defining and analyzing C^3 requirements necessary to establish an efficient and survivable C^3 system in the European environment.

G. RELATED ACTIVITIES: Effort accomplished under this program are used as a part of the input data to a related study and configuration prototype evaluation currently being developed under Program Element 6.37.35.A, Worldwide Military Command and Control System (WWMCCS) Architecture. Each of these studies addresses a different portion of the Command, Control, and Communications environment. To insure that maximum results are obtained from these studies, tasking is managed by ODCSOPS and ACSAC, Headquarters, Department of the Army.

H. WORK PERFORMED BY: International Business Machine (IBM), Incorporated, Rosslyn, VA; Developing Organization - US Army Communications Command, Fort Huachuca, AZ.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The 1976 effort was the initial European C^3 Study; the FY 1977 effort was the development of the

and the formulation of theater nuclear alternatives of the Army Command and Control Master Plan. The FY 1978 program analyzes the results of the

Specific areas are: Communication Security (COMSEC) design of methods, equipment and procedures for necessary

Program Element: #3.31.45.A

Title: EUCOM Command, Control, and Communications Systems (EUCOM C^3 Systems)

DOD Mission Area: #331 - Strategic Command, Control, and Communications (C^3)

Budget Activity: #3 - Strategic Programs

2. FY 1979 Program: The FY 1979 program continues those efforts started in FY 1978, specifically [illegible] and European analyses of Army C^3 requirements. Development will continue on plans for shared facility systems, such as power, life support, communications, and data processing required to meet EUCOM command and control headquarters needs.

3. FY 1980 Planned Program: Finalize survivability, vulnerability, and interoperability studies and produce a comprehensive transition plan for proceeding to an orderly procurement program. Any unresolved and unforecasted requirement arising during FY 1979 will be completed.

4. FY 1981 Planned Program: Not applicable.

5. *Program to Completion*: *Not applicable.*

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.32.15.A — Title: Joint Survivability Investigations
DoD Mission Area: #448 - Aircraft Survivability — Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	581	600	600	600	Continuing	Not Applicable
D079	Joint Survivability Investigations	581	600	600	600	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element supports the Army portion of interservice efforts to ensure that the latest aircraft nonnuclear survivability technology is available for incorporation into design, decisions, and coordination. The Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) compliments ongoing separate Service work and provides the vehicle for cross Service survivability equipment development. The JTCG/AS was formally chartered in June 1971 under the aegis of the Joint Army Materiel, Navy Material, Air Force Logistics, and Air Force Systems Command commanders to ensure that the latest aircraft nonnuclear survivability technology would be available for incorporation into the design of new aircraft. This project responds to the Memorandum of Agreement on Aircraft Survivability Equipment (ASE) for use on Helicopters and Low/Slow Fixed Wing Aircraft signed 29 September 1977 by the Joint Logistics Commanders.

C. BASIS FOR FY 1980 RDTE REQUEST: Research efforts will support the Tri-Service Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS) program as approved by the Joint Logistics Commanders. The FY 1980 submittal includes support for the Combat Data Information Center, a continuation of engine vulnerability baseline tests, development of methodologies for predicting ballistic resistance to non-homogenous materials, development of laser effects assessment techniques, development of Joint Electro-Optical signature measurement standards and investigation of advanced composite structures and armor.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE Funds (as shown in FY 1979 submission)	581	600	600	Continuing	Not Applicable

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.32.15.A
DoD Mission Area: #448 - Aircraft Survivability

Title: Joint Survivability Investigations
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) is specifically chartered to: (1) implement interservice efforts to reduce vulnerability of aeronautical systems in a nonnuclear threat environment; (2) coordinate research and advanced development efforts which contribute to the reduction of aeronautical systems vulnerability; and (3) maintain close liaison with Services to ensure that all survivability research and development data and systems criteria are made available to the developers of new aircraft. The JTCG/AS subgroups are: Technology Development, Vulnerability Assessment, Survivability Assessment, Design Criteria, and Industrial Interface and Countermeasures. In 1972, the JTCG/AS established a Tri-Service aircraft nonnuclear survivability program, Test and Evaluation, Aircraft Survivability (TEAS). Joint tasks were coordinated and proposed to fill research and development (R&D) voids. TEAS was approved by the Deputy Director of Defense Research and Engineering, Test, and Evaluation. TEAS was provided $10 million in Department of Defense (DOD) funds for three years (FY 1973-75). The TEAS program was a technology oriented program whose goals were: (1) conduct vulnerability experiments to strengthen the data base for vulnerability analysis and vulnerability reduction; (2) evaluate design prototype hardware by tests and analyses; (3) develop engineering theory and criteria useful for design; and (4) develop improved computer techniques to predict aircraft subsystem failure and damage effects based on empirical testing. This program complemented separate Service work. The design criteria, specification, and documentation projects developed the design criteria, specifications, military standards, and other documentation now being used by the Services in contracts for future aeronautical systems and technology support projects.

G. RELATED ACTIVITES: The program complements other Army exploratory and advanced development aircraft survivability efforts conducted under Program Elements (PE) 6.22.09.A, Aeronautical Technology; 6.37.11.A/DB52, Scout/Attack Helicopter Survivability Equipment; and 6.37.11.A/D653, Special Electronic Mission Aircraft Survivability Equipment. The basis for the program is the Five Year Plan of the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS). The highest priority efforts within the plan are the basis for the program for each fiscal year which is then approved by the Joint Logistics Commanders. Duplication of effort is eliminated through joint reviews by the JTCG/AS and the Service responsible for each effort. The Five Year Plan, prepared and coordinated with Service staffs, includes only survivability efforts required to complement ongoing Service efforts and to continue to develop survivability as a design discipline in response to user requirements and threat documentation.

H. WORK PERFORMED BY: Work will be performed at US Army Materials and Mechanics Research Center, Watertown, MA; US Army Applied Technology Laboratory, Fort Eustis, VA; US Army Ballistic Research Laboratories, Aberdeen Proving Ground, MD; Naval Air Systems Command, Washington, DC; Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, OH.

Program Element: #6.32.15.A
DoD Mission Area: #448 - Aircraft Survivability

Title: Joint Survivability Technology
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: In 1978 and prior years this program accomplished survivability and vulnerability assessment methodologies, design criteria, and hardware feasibility studies and investigations. Efforts included aircraft engine vulnerability baseline tests, laser vulnerability analysis procedures, determination of damage tolerances, and the characterization of battle damage to composite structures, development of design enhancement features contributing to flight control systems for the AH-1G, UH-1, and OH-58 helicopters. The program completed the development of: a Tri-Service standard for the measurement of Infrared (IR) signatures and formatting of data; design criteria for jam-proof flight controls components; and battle damage tolerant composite joint designs for modular fiber reinforced airframe construction. Data of vulnerability of personnel to laser weapons effects for use in determining cockpit area protection equipments was assembled. The development of methods and procedures to measure the radar cross section of helicopter rotating components was completed.

2. FY 1979 Program: Continuation of programs to develop composite joint design for modular fiber reinforced airframe construction; develop systems and component probability of damage given a hit (P_D II) estimation techniques; develop/refine laser vulnerability analysis procedures and preparation of materials effects data matrix; develop Tri-Service standard for the measurement of electro-optical signatures and for formatting of data; determine vulnerability of personnel in aircrew stations to laser weapons effects; and the measurement of the radar cross section of helicopter rotating components.

3. FY 1980 Planned Program: All service funds are provided to JTCG/AS headquartered at the Naval Air Systems Command, Washington, DC. The Army portion of the FY 1980 program will include two major tasks: (1) the development of ballistic and thermal damage tolerant advanced composite structural elements for helicopters, incorporating radar attenuating materials; and (2) the development of optimum armor systems for defeat of multiple threats, i.e., 7.62mm, 23mm, and missile warhead fragments. Other tasks include: (1) a continuation of engine vulnerability tests to ballistic rounds in order to determine the damage mode and failure effect criteria; (2) development of a set of general equations to describe laser penetration of a variety of sheilding materials on aircraft. Aluminum under continous radiation will the first material modeled; (3) the establishment of standard methods, procedures, and formats for the measurement of electro-optical signatures among the services and industry; and (4) investigations of the combat damage survivability of advanced composite materials being used on aircraft for weight reduction and ballistic tolerance.

4. FY 1981 Planned Program: The FY 1981 program will be formulated by the JTCG/AS and submitted to the Joint Logistics Commanders for approval in FY 1980. The Army portion includes design feasibility efforts in ballistic hardening for engine/drive train, parametric test/data for candidate laser protection materials, continued investigation in composite materials, and improved survivability/assessment analyses.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Surface-to-Surface Missile Rocket Systems
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	46445	62800	72250	71300	204056	465100
D216	Terminally Guided Warhead	0	0	3000	24000	156800	183800
D564	Area Fire Support Rocket - GSRS	46445	62800	69250	47300	47256	281300

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The General Support Rocket System (GSRS) is a multiple launch rocket system designed to neutralize and/or suppress the massive enemy indirect fire support and air defense capabilities. This system is needed particularly during surge periods when the rate of targets acquired exceeds the capability of available cannon weapons fire support. Direct support artillery for the maneuver units will be degraded if it has to assist general support artillery in the counterbattery and air defense suppression roles. The direct support artillery units, along with the air and ground antitank systems, must be allowed to accomplish their intended mission with minimum interference. The ability of the GSRS to deliver a large volume of firepower in a short time against critical, time sensitive targets fills a gap that presently can only be filled by the use of tactical nuclear weapons. Development of a Terminally Guided Warhead (TGW) will permit the attack of armored point targets.

C. BASIS FOR FY 1980 RDTE REQUEST: In September 1977, the Army signed two development contracts for competitive prototypes of the GSRS. In FY 1980 the validation phase will be completed including contractor component and system testing. Government Development and Operational Testing (DT/OT) will be completed. The maturation phase will begin with a single contractor. The TGW project provides for concept definition efforts in FY80.

Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Surface-to-Surface Missile Rocket Systems
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Start Development Test (DT)	Nov 79	Aug 79
Start Operational Test (OT)	Dec 79	Sep 79
Complete DT/OT	Feb 80	Oct 79
Army System Acquisition Review Council (ASARC)	Mar 80	Dec 79
Defense System Acquisition Review Council (DSARC) III	Apr 80	Jan 80
Maturation/Production Contract Award	May 80	Feb 80
Complete Production Qualification Test (PQT) and Follow-on Evaluation (FOE)	Sep 82	
ASARC	Oct 82	Jul 82
DSARC IIIa	Nov 82	Aug 82
Initial Operation Capability (IOC)		

The Validation Phase slipped three months because of the redesign of the rocket necessary to accommodate the German AT II warhead.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	46445	70800	74200	118300	317994

The total program cost increase is due to the redesign of the rocket to satisfy NATO requirements, a revised estimate for the development cost of the General Support Rocket System (GSRS) Self-Propelled Launcher Loader (SPLL), planning for a competitive validation phase for the Terminally Guided Warhead (TGW) project, and revised estimates for system test and integration. The largest portion ($104.2M) results from the restructuring of the TGW development program to include a revised cost estimate. The balance ($42.9M) pertains primarily to the basic program redesign activities and associated adjustments resulting from NATO involvement. The FY 1979 decrease is a result of the Congressional action which deleted $8.0 million from TGW.

Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Surface-to-Surface Missile Rocket Systems
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	0	0	61900	82400	2999805	3144105
Initial Spares	0	0	400	600	1100	2100
Funds (as shown in FY 1979 submission)	0	0	48500		2589100	2637600
Initial Spares	0	0	1400		7300	8700
Quantities (current requirements)	0	0	1764	3000		
Quantities (as shown in FY 1979 submission)	0	0	1764			

The cost estimate increase is due to revisions in cost estimates of the redesigned rocket, cost growth of the self-propelled launcher loader (SPLL), changing the resupply vehicle procurement plan from 346 5-ton trucks to 519 10-ton trucks, adding the requirement for automatic test equipment and revised estimates for recurring engineering and system test and evaluation.

Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Surface-to-Surface Missile Rocket Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The General Support Rocket System (GSRS) is the result of a continuing effort begun in FY 1971. The Institute for Land Combat and the Army Materiel Concept Agency, in a study of the 1980-1990 Battlefield, recommended that a study be conducted for a Rapid Fire Area Saturation System. The study was completed in early CY 1974 and described two short range unguided multiple rocket launcher systems. In late FY 1974, a preliminary cost effectiveness comparison of General Support Rocket System candidates was conducted by a US Army Training and Doctrine Command (TRADOC) Joint Working Group supported by US Army Materiel Development and Readiness Command (DARCOM) resources. The result of this effort strongly favored a short range, simple to operate, economical multiple launched unguided rocket system. Concurrently, preparation of an Army requirements document was initiated. In the second quarter of FY 1975 the Assistant Secretary of the Army (Research and Development) directed that the Army conduct a complete study of the artillery system. The study report, issued in December 1974, included a thorough analysis of the General Support Rocket System (GSRS) and concluded that a relatively small, short range, free rocket could perform the counterbattery, air defense suppression mission in a cost effective manner. Based on the results of these studies, an agreement was concluded between the TRADOC and DARCOM in April 1975. This agreement, approved by the Department of the Army in September 1975, set up procedures for the concept formulation and technology demonstration phases of the General Support Rocket System (GSRS). The initial goals were refinement of system characteristics, conduct of tests necessary to reduce risk, and establishment of confidence levels sufficient for commitment to a full scale development. The confidence levels were based on optimized system parameters, proof of technical feasibility, and investigation of eventual operational doctrine and procedures. A Special Study Group (SSG) was organized in November 1975 to determine system characteristics and develop a concept formulation package. The SSG results were presented to the Defense Systems Acquisition Review Council (DSARC) in January 1977. In February 1977, the Secretary of Defense authorized the Army to proceed with development of the system and directed the Army to study ways to accelerate the acquisition process so that an earlier Initial Operational Capability (IOC) could be achieved. The Army was also directed to continue in its attempt to get NATO participation in the program, to prepare a plan for terminal homing options, to reevaluate the vehicle selected, and to conduct a study to investigate the potential of GSRS to deliver scatterable mines. In April 1977, a special Army Systems Acquisition Review Council (ASARC) approved an accelerated development program which reduced development time from months. Contracts for a 29-month Validation Phase were signed on 16 September 1977 with Vought Corporation and Boeing Company. As a result of the scatterable mine study, the program was redirected to provide a capability to deliver the German AT II Scatterable Mine Warhead. The contracts with the Vought Corporation and Boeing Company had to be renegotiated to accomplish the redesign. The Validation Phase was extended to 32 months without slipping the IOC. The two companies will have prototypes ready for competition in FY 1979. The results of technological efforts in terminal guidance within other program elements, such as prototype tests using infrared seekers completed in September 1977, support the development of the terminal homing option.

G. RELATED ACTIVITIES: There is no development program within another service or agency relative to the General Support Rocket System (GSRS) with its dual-purpose, improved conventional munitions (ICM) warhead. Regarding the Terminally Guided Warhead (TGW), however, the development efforts are closely coordinated with the Assault Breaker Program, Program Element 6.33.20.A and with the Air Force Wide Area Anti-Armor Munition (WAAM). The Office of the Under Secretary of Defense for Research and

Engineering is monitoring these programs to insure integration and to avoid duplication of effort. There has been significant interest in the General Support Rocket System (GSRS) expressed by NATO allies, particularly Germany, the United Kingdom (UK), France, and, most recently, Italy. Strong efforts are being made to establish system standardization within NATO. The US, Germany, France, and the UK are currently negotiating a Memorandum of Understanding (MOU) to establish a cooperative development program. This MOU offers the potential for a single system which will meet the operational requirements of all countries.

H. WORK PERFORMED BY: In FY 1976, five contracts for concept definition studies were performed by: Boeing Company, Seattle, WA; Emerson Electric, St. Louis, MO; Martin-Marietta Corporation, Orlando, FL; Northrup Corporation, Anaheim, CA; and Vought Corporation, Dallas, TX. On 16 September 1977, the Army signed competitive development contracts with Vought Corporation and Boeing Company to build three prototype systems each for delivery in FY 1979. The Army also has contracts with the Harry Diamond Laboratory, Adelphi, MD, to develop the warhead fuze and with FMC Corporation, San Jose, CA, to develop the self-propelled launcher loader (SPLL).

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Army System Acquisition Review Council/Defense System Acquisition Review Council (ASARC/DSARC) I, which approved the start of the Validation Phase, took place in December 1976 and January 1977, respectively. Fuze development was initiated in May 1977 and the SPLL development was initiated in June 1977. System development contracts were signed with Boeing and Vought in September 1977. The program was restructured to satisfy the NATO requirement for a rocket capable of delivering the German AT II Scatterable Mine Warhead (SMW) to a range of kilometers. This lengthened the Validation Phase to 32 months, a three month slip, and increased the RDTE cost by $20 million. The Maturation Phase was reduced to prevent a slip in the Initial Operation Capability (IOC). Vought began Engineering Design Tests (EDT) by firing 12 218mm rockets. Firings were satisfactory. The first SPLL prototype was delivered by FMC. There are no known major technical problems and vehicle testing has begun. The Validation Phase continues and production planning was initiated.

2. FY 1979 Program: Validation Phase and production planning continue. Contractor Engineering Design Tests (EDT) will continue. Government Engineering Design Tests and Advanced Development Verification Tests (ADVT) will start. Each contractor will deliver three prototype systems with rockets and pods.

3. FY 1980 Planned Program: Complete the Validation Phase which includes the Government ADVT and Operational Test (OT). Boeing and Vought systems will be evaluated and if the system is proven ready, the winning contractor will be awarded a contract for design maturation and low-rate initial production (LRIP). The RDTE effort during the Maturation Phase includes design update and hardware fabrication. Production planning will be completed during the Validation Phase. The LRIP contract awarded concurrent with the start of the Maturation Phase will provide hardware for Production Qualification Testing (PQT). Concept Definition (CD) for the Terminally Guided Warhead (TGW) will be completed.

4. FY 1981 Planned Program: Continue the Maturation Phase and Low Rate Initial Production. Maturation environmental qualification testing will be started. Start Validation Phase of the Terminally Guided Warhead (TGW).

5. Program to Completion: This is a continuing program. Low Rate Initial Production (LRIP) deliveries begin in FY 1982 to support the Production Qualification Testing (PQT). The conclusion of PQT is scheduled to provide data to support the Defense System Acquisition Review Council IIIa decision. Hardware deliveries from the LRIP contracts will allow accomplishment of the Initial Operation Capability (IOC). The Technical Data Package (TDP) will be released for procurement from a second source with a full scale competition planned for FY 1986. Complete development of the TGW in FY 1986.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D564 Title: Area Fire Support Rocket - General Support Rocket System
Program Element: #6.33.03.A Title: Surface-to-Surface Missile Rocket Systems
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The General Support Rocket System (GSRS) is the result of a continuing effort begun in FY 1971. The Institute of Land Combat and the Army Material Concept Agency, in a study of the 1980-1990 Battlefield, recommended that a study be conducted for a Rapid Fire Area Saturation System. The study was completed in early CY 1974 and described two short range unguided multiple rocket launcher systems. In late FY 1974, a preliminary cost effectiveness comparison of General Support Rocket System (GSRS) candidates was conducted by a US Army Training and Doctrine Command (TRADOC), Joint Working Group supported by US Army Materiel Development and Readiness Command (DARCOM) resources. The result of this effort strongly favored a short range, simple to operate, economical multiple launched unguided rocket system. Concurrently, preparation of an Army requirements document was initiated. In the second quarter of FY 1975 the Assistant Secretary of the Army (Research and Development) directed that the Army conduct a complete study of the artillery system. The study report, issued in December 1974, included a thorough analysis of the General Support Rocket System (GSRS) and concluded that a relatively small, short range, free rocket could perform the counterbattery, air defense suppression mission in a cost effective manner. Based on the results of these studies, an agreement was concluded between TRADOC and DARCOM in April 1975. This agreement, approved by the Department of the Army in September 1975, set up the procedures for the concept formulation and technology demonstration phases. The initial goals were refinement of system characteristics, conduct of tests necessary to reduce risk, and establishment of confidence levels sufficient for commitment to a full scale development. These confidence levels were based on optimized system parameters, proof of technical feasibility, and investigation of eventual operational doctrine and procedures. A Special Study Group (SSG) was formed in November 1975 to determine system characteristics and developed a complete formulation package. The SSG results were presented to the Defense Systems Acquisition Review Council (DSARC) in January 1977. In February 1977, the Secretary of Defense authorized the Army to proceed with development of the system and directed the Army to study ways to accelerate the acquisition cycle so that an earlier Initial Operational Capability (IOC) could be achieved. The Army was also directed to continue its efforts to get NATO participation in the program, to prepare a plan for terminal homing options, to reevaluate the vehicle selected, and to conduct a study to investigate the potential of GSRS to deliver scatterable mines. In April 1977, a special Army Systems Acquisition Review Council (ASARC) approved an accelerated development program which reduced the development time from Contracts for a 29-month Validation Phase were signed on 16 September 1977 with Vought Corporation and Boeing Company. As a result of the scatterable mine study, the program progress was redirected to provide a capability to deliver the German AT II Scatterable Mine Warhead. The contracts with the Vought Corporation and Boeing Company had to be renegotiated to accomplish the redesign. The Validation Phase was extended to 32 months without changing the IOC. The two companies will have prototypes ready for competition in FY 1979.

Project: #D564 Title: Area Fire Support Rocket - General Support Rocket System
Program Element: #6.33.03.A Title: Surface-to-Surface Missile Rocket System
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

B. RELATED ACTIVITIES: There is no development program within the other services relative to the General Support Rocket System (GSRS). There has been significant interest in GSRS expressed by NATO allies, particularly Germany, the United Kingdom, and France. Strong efforts are being made to establish standardization of the system within the NATO alliance. The US, Germany, UK, and France are currently negotiating a Memorandum of Understanding (MOU) to establish a cooperative development program. This MOU offers the potential for a single system which will meet the operational requirements of these countries.

C. WORK PERFORMED BY: In FY 1976, five contracts for concept definition studies were performed by: Boeing Company, Seattle, WA; Emerson Electric, St. Louis, MO; Martin-Marietta Corporation, Orlando, FL; Northrup Corporation, Anaheim, CA; and Vought Corporation, Dallas, TX. On 16 September 1977, the Army signed competitive development contracts with Vought Corporation and Boeing Company to build three prototype systems each for delivery in FY 1979. The Army also has contracts with the Harry Diamond Laboratory, Adelphi, MD, to develop the warhead fuze and with FMC Corporation, San Jose, CA, to develop the Self-Propelled Launcher Loader (SPLL).

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Army System Acquisition Review Council/Defense System Acquisition Review Council (ASARC/DSARC) I, which approved the start of the Validation Phase, took place in December 1976 and January 1977, respectively. Fuze development was initiated in May 1977 and the SPLL development was initiated in June 1977. System development contracts were signed with Boeing and Vought in September 1977. The program was restructured to satisfy the NATO requirement for a rocket capable of delivering the German AT II Scatterable Mine Warhead (SMW) to a range of kilometers. This lengthened the Validation Phase to 32 months, a three month slip, and increased the RDTE cost by $20 million. The Maturation Phase was reduced to prevent a slip in the Initial Operational Capability (IOC). Vought began Engineering Design Tests (EDT) by firing 12 218mm rockets. Firings were satisfactory. The first SPLL was delivered by FMC. There are no known major technical problems and vehicle testing has begun. The Validation Phase continues and Production planning was initiated.

2. FY 1979 Program: Validation Phase and production planning continue. Contractor Engineering Design Tests (EDT) will continue. Government Engineering Design Tests (EDT) and Advance Development Verification Tests (ADVT) will start. Each contractor will deliver three prototype systems with rockets and pods.

3. FY 1980 Planned Program: Complete the Validation Phase which includes Government Advance Development Verification Tests (ADVT) and Operational Test (OT). Boeing and Vought systems will be evaluated and, if the system is proven ready, the winning contractor will be awarded a contract for design maturation and Low-Rate Initial Production (LRIP). The RDTE effort during the Maturation Phase includes design update and hardware fabrication. Production planning will be completed during the Validation Phase. The LRIP contract awarded concurrent with the start of the Maturation Phase will provide hardware for Production Qualification Testing (PQT).

Project: #D564 Title: Area Fire Support Rocket - General Support Rocket System
Program Element: #6.33.03.A Title: Surface-to-Surface Missile Rocket Systems
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

4. FY 1981 Planned Program: Continue the Maturation Phase and Low Rate Initial Production. Maturation environmental qualification testing will be started.

5. Program to Completion: Low Rate Initial Production (LRIP) deliveries begin in FY 1982 to support the PQT. The conclusion of PQT is scheduled to provide data to support the Defense System Acquisition Review Council (DSARC) IIIa decision. Hardware deliveries from the LRIP contracts will allow accomplishment of the Initial Operational Capability (IOC). The Technical Data Package (TDP) will be released for procurement from a second source with a full scale competition planned for FY 1986.

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army Systems Acquisition Review Council (ASARC) I	Dec 76	Dec 76
Defense Systems Acquisition Review Council (DSARC) I	Jan 77	Jan 77
Special ASARC	Apr 77	Apr 77
Development Contracts (2)	Sep 77	Sep 77
Start Development Tests (DT I)	Nov 79	Aug 79
Start Operational Tests (OT I)	Dec 79	Sep 79
Complete DT/OT I	Feb 80	Oct 79
ASARC III	Mar 80	Dec 79
DSARC III	Apr 80	Jan 80
Maturation/Production Contract Award (1)	May 80	Feb 80
ASARC IIIa	Oct 82	Jul 82
DSARC IIIa	Nov 82	Aug 82
Initial Operational Capability (IOC)		

The Validation Phase was extended three months because of the redesign of the rocket to accommodate the German AT II warhead.

Project: #D564
Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Area Fire Support Rocket - General Support Rocket System
Title: Surface-to-Surface Missile Rocket Systems
Budget Activity: #4 - Tactical Programs

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	46445	62800	69250	47300	47256	281300
Funds (as shown in FY 1979 submission)	46445	62800	61300		59600	238394

The cost increase in FY80 is due to the redesign of the rocket, a revised cost estimate for the General Support Rocket System (GSRS) carrier vehicle, and increase in system test costs.

Other Appropriations:

Missile Procurement, Army						
Funds (current requirements)	0	0	61900	82400	2999805	3144105
Funds (as shown in FY 1979 submission)	0	0	48500		2589100	2637600
Quantities (current requirements)	0	0	1764	3000	[ ]	[ ]
Quantities (as shown in FY 1979 submission)	0	0	1764		[ ]	[ ]

Increases in procurement costs in FY80 are due to the higher cost of the redesigned rocket and increased cost of the Self-Propelled Launcher Loader (SPLL), changing the resupply vehicle from a 5-ton truck to a 10-ton truck, adding the requirement for automatic test equipment and revised estimates for recurring engineering and system test and evaluation.

Project: #D564
Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Area Fire Support Rocket - General Support Rocket System
Title: Surface-to-Surface Missile Rocket System
Budget Activity: #4 - Tactical Programs

E. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: Contracts for the General Support Rocket System (GSRS) were signed with Boeing Company, Seattle, WA, and Vought Corporation, Dallas, TX, on 16 September 1977 for the competitive Validation Phase of the GSRS program.

a. During Validation Phase the major test to be conducted is the Development Test (DT) I. This will begin in FY 1979 and continue into FY 1980. Objectives of the DT I are as follows:

(1) Engineering Design Tests (EDT) - provide reliability and safety margin data; determine natural and induced environmental effects; establish performance levels; select and qualify components; conduct selected severe qualification and hazard classification tests; conduct launch hazard analysis; and identify technical risks and achievable solutions. Contractor Engineering Design Tests (EDT-C) will examine the feasibility of the GSRS hardware design. Components, subsystems, and systems will be tested to investigate the ability of the hardware design to satisfy the requirements of the system specification in a cost effective manner. Government Engineering Design Tests (EDT-G) will include the tests of a number of critical parts, components, subsystems, and systems. These tests will be performed by the Government because of the unique test facilities and expertise required. This will also allow the Government to acquire an intimate knowledge of the hardware. Data from EDT-G will be made available to respective contractors and the independent evaluators. Competitive sensitive information will be protected.

(2) Advanced Development Verification Tests (ADVT) - obtain human factors and ground support equipment performance data in a simulated arctic and desert environment; identify system emissions, effluents, and wastes; and perform system demonstration flights. Contractor Advance Development Verification Tests (ADVT-C) will demonstrate that technical risks have been identified and economical solutions are available. The contractor will test subsystems and systems to verify that the design approach is capable of evolving into a ruggedized weapon system that will achieve the necessary reliability and performance goals during the Maturation Phase. ADVT-C will include performance testing of subsystems and systems plus flight tests. Selected items will be exercised during exposure to high and low temperature extremes. The test program will insure that the system is capable of passing further Government testing such as Government Advance Development Verification Test (ADVT-G) and Operational Test (OT) I. The ADVT-G will be a comparison of the prototype systems developed by the two competing contractors. The Government will test selected subsystems and systems considered critical to individual design. ADVT-G will provide the final quantitative data points and will include ground and flight tests.

b. During the Maturation Phase the major test to be conducted will be the Production Qualification Tests (PQT). This will include first article-initial production tests to assure contract compliance and quality assurance. The PQT will also assure that engineering is complete, that reliability and maintainability have been demonstrated, and that all significant design problems are in hand. Testing will provide for the development of the firing tables, for a safety confirmation, and to verify correction of problem areas previously identified which necessitated engineering changes during maturation.

2. Operational Test and Evaluation: The General Support Rocket System (GSRS) Operational Test (OT) I will be an integral part of a combined Development Test I/Operational Test I (DT I/OT I). The OT I portion of the test will consist of six weeks of operational testing scheduled to begin in FY 1980. Two firing sections, each manning a GSRS candidate system, will conduct a series of firing and nonfiring operational exercises in a realistic tactical environment. OT I will concentrate on man-machine interfaces in obtaining information on the military potential of GSRS. OT I will be conducted in three phases. Phase I will take place at Ft Sill, OK, and will consist of three weeks devoted to training and pilot testing. Phase II, also conducted at Ft Sill, will consist of two weeks of nonfiring exercises in a realistic tactical environment. Phase III will be a combined DT/OT live fire exercise lasting one week. It will be conducted at White Sands Missile Range (WSMR), NM, during which 12 rockets will be fired from each of the candidate systems. OT I will obtain data to assess operational effectiveness; provide information on reliability, availability, and maintainability (RAM); provide information on operational survivability of the GSRS as a result of signature, mobility, emplacement, and displacement; and provide information on human factors, safety, training, doctrine, organization, tactics, and the adequacy of the proposed logistical concepts to support GSRS to the extent that existing hardware and support package will permit. Data collected and associated analyses will be provided to the Army Systems Acquisition Review Council (ASARC) III as part of the information required for a decision concerning entry into the concurrent Maturation and Production Phases. A Follow-on Evaluation (FOE) will be conducted during the Maturation Phase to insure that remaining test issues have been resolved.

3. System Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Range	[ ]	Footnote 1/
Reaction Time: Fire 1st round		Footnote 1/
Fire Launcher Load		
Displace		
Reload		

Project: #D564
Program Element: #6.33.03.A
DoD Mission Area: #413 - Fire Support

Title: Area Fire Support Rocket - General Support Rocket System
Title: Surface-to-Surface Missile Rocket System
Budget Activity: #4 - Tactical Programs

Operational/Technical Characteristics	Objective	Demonstrated Performance
Accuracy		Footnote 2/
Reliability: Rocket		Footnote 2/
Launcher, Mean Cycle Between Failures		
Launcher, Mean Kilometers Between Failures		
Achieved Availability		Footnote 2/
Maintainability, Launcher (Mean-Time-To-Repair)		
Organizational Level	1.0 hr	Footnote 2/
Direct Support/General Support Levels	4.0 hr	

1/ To be demonstrated during Development Test (DT) I/Operational Test (OT) I.
2/ Initial data to be gathered during DT I/OT I; demonstration of performance will continue through maturation and system fielding.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.20.A
DoD Mission Area: #422 - Interdiction

Title: Assault Breaker
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	9200	7900	To be determined	To be determined
	QUANTITIES						To be determined
D302	Assault Breaker	0	0	9200	7900	To be determined	To be determined

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The total Defense Advanced Research Projects Agency (DARPA) Assault Breaker concept couples an Air Force developed airborne target acquisition/tracking/command guidance system with an Army ground tactical fire control center and field artillery surface-to-surface missile (SSM) system containing terminally guided submunitions with engagement effectiveness to support the requirement of attriting large quantities of threat mobile hard point targets (tanks, APC's, trucks, mobile SAM's, etc.) in a very short time up to km beyond the forward edge of the battle area. The option also exists for an air delivered weapon containing terminally guided submunitions. This Assault Breaker capability is required to accomplish the task of interdiction by destroying, neutralizing or impeding threat forces enroute to the front, i.e., affecting the arrival rate of enemy second echelon regiments and divisions prior to their arrival in the central battle arena. An Assault Breaker capability could provide rapid attrition of enemy second echelon forces to insure that enemy force ratios do not exceed a level that can be contained by the defending NATO ground forces. This antiarmor capability makes Assault Breaker a viable candidate for worldwide deployment.

C. BASIS FOR FY 1980 RDTE REQUEST: The only delivery missile candidate funded in the current technology demonstration is PATRIOT, with associated dispensers. The FY 1980 RDTE request will also fund T-22 booster (LANCE variant) and associated dispenser work so that this alternative can also be demonstrated. This will provide competition in the demonstration which is considered to be absolutely essential to provide the opportunity for expeditious entry into development. The FY 1980 RDTE request will also provide funds for the Army to perform the preliminary in-house effort required to prepare for assuming service control of the program for development as appropriate at the end of the demonstration. Such preparation must begin in FY 1980 to assure expeditious entry into development.

Program Element: #6.33.20.A
DoD Mission Area: #422 - Interdiction

Title: Assault Breaker
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Begin Technology Demonstration	April 1978	None
Complete Technology Demonstration	February 1981	None
ASARC II	June 1981	None
DSARC II	July 1981	None

The technology demonstration has been initiated and above dates established since the FY 1979 submission.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	0	10300	To be determined	To be determined	To be determined

Funds requested for FY 1979 were transferred to the Defense Advanced Research Projects Agency to provide for centralized control of the program through the technology demonstration. Funds requested for FY 1980 add an essential element to the demonstration as indicated in paragraph C above and provide resources to permit execution of Army responsibilities in preparation for a development decision.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	0	0	0	0	To be determined	To be determined
Funds (as shown in FY 1979 submission)	None	None	None	None	None	None

Program Element: #6.33.20.A
DoD Mission Area: #422 - Interdiction

Title: Assault Breaker
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Addtional to Completion	Total Estimated Cost
Quantities (current requirements)	0	0	0	0	To be determined	To be determined
Quantities (as shown in FY 1979 submission)	None	None	None	None	None	None

Procurement requirements will be established concurrently with a development decision.

Program Element: #6.33.20.A
DoD Mission Area: #422 - Interdiction

Title: Assault Breaker
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Goals of the Assault Breaker technology demonstration are to identify those system elements required to increase the US capability to attack threat second echelon forces under day/night, good/adverse weather and to capitalize on existing programs and technologies to demonstrate the system concept. During the joint Army/Air Force Anti-Armor ENGAGER Study, the critical technologies associated with effective long range anti-armor engagement were identified as those associated with target acquisition, tracking and command guidance and those associated with the terminal attack phase or endgame. Hence, the Air Force in conjunction with DARPA, is conducting a target acquisition, tracking and command guidance demonstration (scheduled for completion early FY 81) and the Army in conjunction with DARPA is conducting an endgame technology demonstration (scheduled for completion 4th Qtr FY 80). The Army endgame demonstration will include free flight drop tests of smart munitions, wind tunnel and sled tests of a submunition dispenser, warhead lethality assessments, and culminate with a flight test of the total endgame. A joint Army/Air Force technology demonstration integrating the Air Force's foregame with the Army's endgame is scheduled for mid-FY 81. These technology demonstration plans are success oriented, considered to be of medium to high risk, and are absolutely necessary to validate the concept before full commitment to systemization is made. DARPA is presently the lead agency for the program and is scheduled to guide the program through the FY 81 demonstration period, at which time DARPA will transfer control of the program to the Services. Therefore, upon successful completion of the planned demonstrations, the Army must be prepared to accept the program in FY 81 and commence Assault Breaker development as appropriate.

G. RELATED ACTIVITIES: The Assault Breaker program will take advantage of on-going Advanced Research Project Agency Tactical Technology (Program Element (PE) 6.27.02.E) efforts; Missile Technology (PE 6.23.03.A); complementary efforts of the Army Missile Research and Development Command's Terminally Guided Submunition (TGSM) work and the Air Force's Wide Area Anti-Armor Munitions (WAAM) Program; Air Force Activity 6.46.13.F; warhead technology associated with the LANCE Missile System and General Support Rocket System (GSRS); target acquisition/tracking/command guidance technology associated with the Army's Stand-Off Target Acquisition System (SOTAS); and missile booster technology associated with the LANCE and PATRIOT missile systems.

H. WORK PERFORMED BY: DARPA has been tasked to provide overall direction and control of the program through the FY 1981 technology demonstration. The Army's endgame technology (booster, dispenser, seeker/sensor, submunitions) is being worked and managed by the Army's Missile Research and Development Command, Huntsville, AL. The Air Force's target acquisition/tracking/command guidance system is being worked and managed by Air Force System Command's Rome Air Development Center, Griffiss Air Force Station, NY. The following Phase II (FY 79) contracts were awarded for the Army/DARPA Assault Breaker Endgame Demonstration:

1. Boeing Corporation, Seattle, WA, for dispenser and TGSM airframe. Subcontractors are Raytheon Corporation, Bedford, MA, for infrared (IR) seeker and Sperry, Clear Water, FL, for millimeter wave (MMW) seeker.

2. Martin Marietta Corporation, Orlando, FL, for dispenser and smart bomblet.

3. General Dynamics (Pomona Division), Pomona, CA, for infrared terminally guided submissiles.

4. AVCO, Wilmington, MA, for SKEET submunition.

5. Hughes Aircraft Corporation, Canoga Park, CA, for sensor controlled submunition (SCS).

6. Science Applications Incorporated, Huntsville, AL, for systems integration.

Approval of the FY1980 request will permit Vought Corporation, Dallas, TX, to continue work on the T-22 booster and associated dispenser. Ballistic Research Laboratory, Aberdeen, MD, is doing the warhead work with some contract effort by Physics International, San Leandro, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Awarded eight Endgame Technology Demonstration contracts; completed infrared and millimeter wave seeker captive flight tests.

2. FY 1979 Program: Prepare Joint Mission Element Need Statement (JMENS); concept definition; free flight drop tests of guided submissiles and smart bomblet; wind tunnel and sled tests of a submissile dispenser; lethality assessments of appropriately sized warheads.

3. FY 1980 Planned Program: Flight test of the total endgame will be conducted under the DARPA technology demonstration program. The requested funds will permit the T-22 booster and associated dispenser to be added as an essential competitor in those flight tests. A project office will also be established to being preparations for Service control of the program and subsequent development. Major activities include preparation of concept formulation package, cost/performance analyses, engineering estimates, systems integration simulation model, Request for Proposal (RFP), and other required documentation leading to a development decision.

4. FY 1981 Planned Program: Program management and technical support of program office; Stand-Off Target Acquisition System (SOTAS) command guidance demonstration; Integrated Army endgame/Air Force foregame technology demonstration; Army System Acquisition Review Council (ASARC) II/Defense Systems Acquisition Review Council (DSARC) II leading to a consideration to initiate Engineering Development (Validation-Maturation Phase) and award of competitive contracts for developing prototypes of complete system if appropriate.

5. Program to Completion: To be determined based upon results of technology demonstrations and Concept Definition Studies.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.04.A
DoD Mission Area: #218 - Advanced Weapons Effects and Nuclear Munitions

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1967	2399	[redacted]	[redacted]	Continuing	Not Applicable
D089	Nuclear Burst Detection System (NBDS)	0	600	500	1800	5900	11000
D135	Nuclear Weapon Development Support	595	720	500	520	Continuing	
D148	Atomic Demolition Munition (ADM) Firing and Control System	0	0	[redacted]	[redacted]	[redacted]	[redacted]
D153	Nuclear Effects Support Team (NEST)	0	400	500	520	Continuing	
D390	Tactical Earth Penetrator (TEP)	0	0	[redacted]	[redacted]	[redacted]	[redacted]
D443	Nuclear Projectiles Advanced Development	1187	379	[redacted]		Continuing	
D483	Radiological Detection Measuring Equipment	185	300	300	415	Continuing	

Program Element: #6.36.04.A
DoD Mission Area: #218 - Advanced Weapons Effects and Nuclear Munitions

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army must be able to conduct both offensive and defensive operations. This requires equipment which can immediately and accurately detect a nuclear burst, equipment which will survive in a nuclear environment and materiel that will provide a nuclear defensive capability. An operational requirement exists to collect, consolidate, report and disseminate nuclear burst data. This is presently planned to be done manually which would require numerous soldiers to report visual sightings over unit command nets. This reporting system would burden the existing voice communications links at a time when they would be needed for other operational needs. Furthermore, exercises have shown that the manual system produces inaccurate and subjective results is slow and non-responsive and places an additional training burden on lower echelons units. The Nuclear Burst Detection System (NBDS) will provide a capability to assess the impact on all unit operations of either a single or multiburst nuclear strike. The data will be reported and processed accurately, quickly and automatically. The system will eliminate additional voice communications on already heavily saturated communications links. Furthermore, it will free the soldiers to concentrate on their primary tasks, and through automatic transmission, will relieve the intermediate commanders of processing raw data and converting it to meaningful operational information. The NBDS will greatly improve the tactical commanders' capability to plan and conduct operations in a nuclear environment. This program element will also provide support for the development of technology to upgrade our radiation detection equipment which is old, bulky, has limited response capability, and does not provide individual as well as tactical monitoring information for prompt radiation. Successful advanced development efforts will be transferred to equipment undergoing engineering development. Equipment requiring nuclear hardening for survivability must have nuclear hardening appropriately applied during the development process. The Project Manager Nuclear Munitions, must be able to interface with the nuclear systems Project Managers (PM's), the Department of Energy and Army Laboratories, and the Department of the Army staff on nuclear matters. He must also provide support to development efforts that pertain to nuclear programs as a whole and not to any system in particular. The Nuclear Development Support project addresses this requirement. Advancements in the state-of-the-art in ballistics and conventional ammunition must be applied to the family of nuclear projectiles to minimize the proliferation of special purpose artillery projectiles on the battlefield. Modernization of the Army's Atomic Demolition Munition (ADM) is required as well as development of an advanced firing system (AFS). Current ADM's represent the technology of the 1960's and do not have the level of command and control inherent in the modern weapons currently entering the stockpile. Furthermore, development of a Tactical Earth Penetrator (TEP) as a complement to ADMs must be continued. Advanced development of a TEP weapon is being conducted within the PERSHING II program (Program Element 6.43.11.A). This program element will provide the technology to meet these modernization needs.

C. BASIS FOR FY 1980 RDTE REQUEST: Advanced development of cost-effective improvements in nuclear projectile technology such as improved rocket assist propellants will continue. Artillery application of tactical earth penetrators will be developed. Development of a Nuclear Burst Detector will continue. Support for various PMs in the area of nuclear survivability will be expanded as part of the Army Nuclear Survivability Program. Improvements in the family of radiological detection and measuring equipment will be developed and preparation for transition either to further engineering development or directly to production will be made. Support of Joint DOE-DOD Phase 2 Nuclear Weapon Feasibility Studies will continue.

Program Element: #6.36.04.A
DoD Mission Area: #218 - Advanced Weapons Effects and Nuclear Munitions

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE.					
Funds (as shown in FY 1979 submission)	1871	2399	-	Continuing	Not Applicable

The decrease in FY 1980 is due primarily to maintaining the Nuclear Burst Detection System (NBDS) in advanced development (AD) an additional year, initiating the AD work on the 155mm nuclear projectile later than expected and maintaining a lower level-of-effort for the PM/Nuclear Munitions.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.04.A
DoD Mission Area: #218 - Advanced Weapons Effects and Nuclear Munitions

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Emphasis on the advanced development (AD) of artillery projectiles is to increase range, reduce collateral damage, and improve safety, security and command and control. The increased range concepts provide substantially improved effectiveness and survivability of the nuclear delivery forces. The reduced collateral damage efforts enhance deterrence by making the nuclear forces a more credible deterrent. Artillery applications of earth penetrator technology offer the potential for cost effective stand-off atomic demolition munitions and for attack of hardened structures with reduced collateral damage. The family of radiological detection, measurement and alarm devices will be improved through application of technology developed in this Program Element (PE). The objective is to apply such improvements as "large scale integration" technology to electronics in radiac equipment and to transition such improvements directly to production without further engineering development. Potential cost savings in applying this technology are substantial. R&D support for non-system related functions such as overall command, control and security of the nuclear stockpile will be provided by the Project Manager (PM)/ Nuclear Munitions. A Nuclear Effects Support Team will provide technical support to system PM's in the area of nuclear survivability and hardening. This is a key element of the Army Nuclear Survivability Program.

G. RELATED ACTIVITIES: This program complements and is closely coordinated with Department of Energy (DOE) advanced development efforts. Exploratory development efforts in PE 6.26.03.A, Large Caliber and Nuclear Technology, are utilized. Tactical Earth penetration programs under PERSHING II auspices, PE 6.33.11.A, and those being accomplished by the Defense Nuclear Agency also are incorporated. There is no duplication of efforts under the Department of the Air Force nuclear burst detection programs which are oriented on strategic rather than tactical weapon detonation detection. Tri-Service radiological detection programs are coordinated and integrated.

H. WORK PERFORMED BY: US Army Armament Research and Development Command, Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; US Army Materiels and Mechanics Research Center, Watertown, MA; and US Army Electronics Research and Development Command, Fort Monmouth, NJ. Principal contractors include Bendix Corporation, South Bend, IN; and Sandia Laboratories, Albuquerque, NM.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: AD of various artillery projectiles, atomic demolition munitions and surface-to-surface missile adaption kits was completed in the early to mid 1970's. This technology has been transferred to appropriate engineering development programs such as the 8-inch nuclear projectile. The Nuclear Burst Detection System continued at a low level utilizing FY 1977 funds that were specifically earmarked for this purpose when budget adjustments were made in December 1976. PM/Nuclear Munitions continued to provide assistance in identifying improvements required in the nuclear weapon stockpile. The radiological detection and measuring equipment level-of-effort development of cost effectiveness improvements (digital and large scale integration technology) to radiac equipment were continued.

Program Element: #6.36.04.A
DoD Mission Area: #218 - Advanced Weapons Effects and Nuclear Munitions

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Support to Project Manager (PM)/Nuclear Munitions for nonsystem related effort will be expanded to provide additional support to the Tri-Service emergency disablement systems programs. Nuclear Effects Support Team effort will begin. This effort provides substantial support to system PMs in the area of nuclear survivability and is a key element in the Army Nuclear Survivability Program. AD work supporting the 155mm nuclear projectile will be completed. Additional effort will focus on developing the technology for extended range and improved safety for nuclear artillery projectiles. Level-of-effort development on cost effective improvements to radiac equipment will be continued. Level of effort on the Nuclear Burst Detector will begin.

3. FY 1980 Planned Program: Level of effort funding will maintain the Nuclear Burst Detector in advanced development (AD). Support by PM/Nuclear Munitions for nonsystem related programs will be continued. Support to PMs will be continued in the area of nuclear survivability. Testing of extended range, reduced collateral damage concepts for artillery projectiles will be expanded. Technological development of radiac components will be continued. Requirements for an Atomic Demolition Munition (ADM) firing and control system will be investigated, coordinated and finalized.

4. FY 1981 Planned Program: Continue advanced development and conduct initial feasibility testing of the Nuclear Burst Detection System. Continue support by PM/Nuclear Munitions for nonsystem related programs. The Nuclear Effects Support Team will continue to support PMs in the area of nuclear survivability. Based on requirements generated in preceeding year, an ADM firing and control system will be designed and initial development will commence. The tactical earth penetrator program will commence with selection of one or two competitive approaches for AD. Development of radiac components will be continued.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.08.A
Title: Weapons & Ammunition
DoD Mission Area: #412 - Close Combat
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4791	500	3742	9105	Continuing	Not Applicable
D009	60mm Ammunition	0	500	0	1105	Continuing	Not Applicable
D160	Infantry Munition	679	0	0	0	0	Not Applicable
D161	Tank Ammunition	2659	0	3742	8000	Continuing	Not Applicable
D162	Tank Target Practice	1453	0	0	0	0	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program is to develop ammunition to counter future close combat enemy threats by improving terminal effectiveness, accuracy, range, and reliability. This program element consists of two projects supporting tank and mortar ammunition development. Project D009 supports studies, design, and development of the XM722 60mm smoke cartridge for the Lightweight Company Mortar system to provide battlefield obscuration. Project D161 provides for Advanced Development of; the XM833 Armor Piercing Fin Stabilized Discarding Sabot-Tracer (APFSDS-T) cartridge with a staballoy penetrator to combat the threats projected beyond the 1982 time frame, the XM815 High Explosive Antitank Multipurpose Tracer (HEAT-MP-T) cartridge as a companion to the APFSDS-T rounds for improved antitank, antihelicopter, and antipersonnel capability, and the XM828 120mm cartridge for improving first round hit probability at extended ranges by delivering multiple penetrators in a single sabot round.

C. BASIS FOR FY 1980 RDTE REQUEST: The FY 1980 program initiates Advanced Development efforts for the XM815 and XM833 cartridges. Funds provide for: Validation tests, building of Development Test (DT) I hardware and initiation of producibility studies for the XM815; and completion of Advanced Development tests, DT I, and Validation In-Process Review (IPR) for the XM833 cartridge.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
XM833		
Validation In-Process Review	4Q FY 1980	Not Shown
Type Classification Std	4Q FY 1982	Not Shown

Program Element: #6.36.08.A
DoD Mission Area: #412 - Close Combat

Title: Weapons & Ammunition
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
XM815		
Validation In-Process Review	4Q FY 1981	Not Shown
Type Classification Std	4Q FY 1983	Not Shown
XM722		
Validation In-Process Review	4Q FY 1981	Not Shown
Type Classification Std	2Q FY 1984	Not Shown

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	4791	500	445	Continuing	Not Applicable

The increase for FY 1980 is due to initiation of Advanced Development program on the XM815, 105mm High Explosive Antitank - Multipurpose Round and the XM833, 105mm Armor Piercing, Fin stabilized, Discarding Sabot (APFSDS-T) round.

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.36.08.A
DoD Mission Area: #412 - Close Combat

Title: Weapons & Ammunition
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Two projects are being pursued under this program element. Project D009 is for Advanced Development of a 60mm smoke cartridge for the Lightweight Company Mortar (LWCM) system. Project D161 includes the development of cartridges, XM815 and XM833 for the 105mm tank gun system, and cartridge XM828 for the 120mm tank gun system. Advanced Development of the Tank Target Practice round, XM797, was completed and the program has been transitioned to Program Element 6.46.02, Weapons and Ammunition, for completion of Engineering Development.

G. RELATED ACTIVITIES: Projects in this program are supported by exploratory development programs under Program Elements 6.26.03, Large Caliber and Nuclear Technology, 6.26.18, Ballistics Technology, and 6.46.02, Weapons and Ammunition. Developments in this program are compatible with US Marine Corps requirements, and are closely coordinated to preclude duplication of effort. To avoid proliferation of programs within each of the Services, all programs are coordinated with appropriate joint technical coordinating groups.

H. WORK PERFORMED BY: In-house agencies include US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; and US Army Test and Evaluation Command, Aberdeen Proving Ground, MD. Contractors include Honeywell, Minneapolis, MN; Chamberlain Manufacturing Corporation, Waterloo, IA; Battelle-Northwest Laboratories, Richland, WA; Sandia Livermore Laboratories, Livermore, CA; Rockwell International, Denver, CO; National Lead Company of Ohio, Fernald, OH; Flinchbaugh Products, Incorporated, Red Lion, PA; Kennametal, Incorporated, LaTrobe, PA; Teledyne Firth-Sterling, Pittsburgh, PA; National Lead of Albany, Albany, NY.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Advanced Development was completed on 105mm Armor Piercing, Fin Stabilized, Discarding Sabot-Tracer (APFSDS-T) cartridges XM774 and XM735; and these rounds transitioned into full scale Engineering Development. The M735 was type classified standard in 1977 and the XM774 is scheduled for type classification standard in the second quarter FY 1979. Advanced Development programs for the 60mm mortar smoke cartridge XM722 and the XM797 Tank Target Practice cartridge were initiated.

2. FY 1979 Program: During this period, Advanced Development will continue on smoke cartridge XM722 for the Lightweight Company Mortar System. The XM797 Tank Target Practice cartridge will transition into Engineering Development.

3. FY 1980 Planned Program: Efforts will be concentrated on refining the exploratory development design of the XM815 cartridge, to include conducting more extensive accuracy tests at all ranges and temperature conditions, static penetration tests of the explosive charge, armor penetration tests, and a panel fragmentation test to characterize the fragmentation capabilities. Advanced Development efforts for the XM833 APFSDS-T cartridge will involve testing of two sabot designs for use with the modern technology, long rod, staballoy penetrator.

4. FY 1981 Planned Program: Development Test (DT) I of the HEAT-MP-T round XM815 will be completed and the Validation In-Process Review held. Advanced Development of the XM828 Multi-Dart APFSDS-T cartridge will be initiated. Advanced Development of the XM722 60mm smoke cartridge will continue.

5. Program to Completion: This is a continuing program. The 105mm tank cartridges XM833 and XM815 will transition into Engineering Development. Hardware testing and design validation of the 120mm Multi-Dart round XM828 will continue.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.12.A
DoD Mission Area: #412 - Close Combat

Title: Antitank Guided Missile (ATGM) Improvements
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1936	6000	12000	29250	253614	302800
	QUANTITIES						350
D097	ATGM Improvements	1936	6000	12000	29250	253614	302800

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A recent Director Central Intelligence (DCI) analysis of the current and projected Soviet tank threat has indicated cause for concern on the follow-on tanks of the mid-1980s. Due to this assessment, and the major dificiencies identified in the current infantry antiarmor weapons (see TOW PE 2.37.24.A), the Army has accelerated efforts for improved infantry antiarmor capabilities.

have improved performance in countermeasures and obscurants environment of the battlefield and provide for quick engagement of the new, more mobile armored vehicles of the mid-1980s, the Army will pursue technology demonstrations of critical antiarmor missile components during 1980. This will include an evaluation of the most promising command guided and terminal homing technologies. Modifications of existing vehicles for the potential application of a ground launch version of the HELLFIRE system will also be examined. This program will provide the basis for continuing discussions with our NATO allies for a possible cooperative effort for a family of complementary antiarmor weapons. The technology demonstrations will minimize the delay for entry into a development effort in 1981 for a complementary antiarmor weapon upon completion of the negotiations with our NATO allies.

C. BASIS FOR FY 1980 RDTE REQUEST: FY 1980 funds will provide for the technology demonstrations of critical hardware components. These funds will be used for engineering design, fabrication, assembly, and test of key components of proposed systems. This will include static motor tests of the propulsion subsystems, warhead tests, and laboratory and field tests of acquisition/guidance hardware. As a part of this effort, studies of vehicle modifications needed to determine the potential of a ground launched HELLFIRE will be made.

Program Element: #6.36.12.A
DoD Mission Area: #412 - Close Combat

Title: Advanced Guided Missile (ATGM) Improvements
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army Decision Review	December 1978	October-November 1978

The Decision Review had a one month slip in the Study Group schedule due to the re-direction by the Army after notification of the Director Central Intelligence (DCI) threat assessment.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands):

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	1936	8100	32208	226792	259000

Congress reduced the FY 1979 funds for this program to $1.0 million and directed the Army to evaluate ground-launched HELLFIRE. The results of the FY 1978 concept definition studies, to include ground-launched HELLFIRE, were completed in December 1978. The initial results indicated that the HELLFIRE in the ground launch role would not be a suitable replacement for the TOW due to cost, launch platforms incompatibility and additional human factors/training/logistics problems associated with the infantry application. However, the Army plans to conduct studies of vehicle modifications to explore the application of a ground launched HELLFIRE that may alleviate these problems. $5.0 million in FY 1979 funds from the supplemental request were added to complete evaluation of ground launched HELLFIRE vehicle modifications and initiate the technology demonstration efforts. This action will minimize the delay in meeting the requirement until the negotiations with our NATO allies can be completed. The FY 1980 funds decreased due to the change in plans to pursue a quick fix (retrofit) for TOW to meet near term threat and competitive technology demonstrations in preparation for initiating a follow-on development program. Total estimated costs increased due to plans to

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.12.A
DoD Mission Area: #412 - Close Combat

Title: Antitank Guided Missile (ATGM) Improvements
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DISCUSSION: Due to a recent change in the threat reported by the Director Central Intelligence (DCI) the Army has accelerated efforts to make substantial improvements to the TOW (tube-launched, optically tracked, wire-command) antitank missile system. Immediate improvements to counter the current threat have been initiated under the TOW line (see PE 2.37.24.A) to develop a retrofit to the existing inventory.

To counter the Soviet follow-on tanks, provide improved performance in the countermeasures and obscurants environment of the battlefield, and rapid engagement against faster, more mobile armored vehicles of the mid-1980s, the Army will evaluate the critical components of a number of maturing technologies that could meet the performance requirements. This will include an evaluation of launch platforms modifications to examine the potential of a ground launched HELLFIRE. With the recently eexpressed interest by our NATO Four Power Allies (France, Federal Republic of Germany, and United Kingdom) in a cooperative effort for a common family of antiarmor weapons, the initiation of a specific development program will be delayed until 1981. This will allow time to complete discussions with our allies and work towards a memorandum of understanding.

and to insure that the delay in meeting the requirement is minimized, the Army will conduct technology demonstrations of guidance and vehicle integration components during 1980 in preparation for a development effort and a data exchange with our NATO allies. The Army plans to conduct these demonstrations to insure that the technical issues are resolved and allow for entry into a maturation stage of development when the NATO discussions have been finalized.

G. RELATED ACTIVITIES: TOW Missile System (P.E. 2.37.24.A), Advanced Munitions Project (P.E. 6.33.13.A), Defense Advanced Research Projects Agency (DARPA) Technology Investigations and Missile Technology (P.E. 6.23.03.A). This system is planned to be a phased-in major improvement to the TOW system in the time frame. This improvement will be compatible with existing and planned TOW platforms.

H. WORK PERFORMED BY: US Army Missile Research and Development Command (MIRADCOM), Redstone Arsenal, AL, with contractors to be selected competitively.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Evaluated the results of exploratory development tests of acquisition/guidance hardware, warheads, and propellants. Evaluated results of smoke and countermeasures tests and reports describing the operation of a number of acquisition/guidance techniques. Conducted a concept study effort and evaluated eight system proposals. Initiated discussions with NATO allies for a potential cooperative development effort.

Program Element: #6.36.12.A
DoD Mission Area: #412 - Close Combat

Title: Antitank Guided Missile (ATGM) Improvements
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Complete concept formulation and initiate competitive technology demonstrations. This will include hardware contracts for key components of laser beamrider and other maturing guidance technologies (focal plane array, millimeter wave, etc.) that could provide the required improved performance. In addition, vehicle modifications for a potential application of ground launched HELLFIRE will be evaluated. Continue discussions with North Atlantic Treaty Organization (NATO) allies relative to possibilities for a cooperative effort.

3. FY 1980 Planned Program: Continue technology demonstrations. Work to be accomplished in this year includes fabrication, assembly, and test of key components of laser beamrider and other guidance technologies (focal plane array, millimeter wave, etc.). Complete evaluation of ground launched HELLFIRE and make a final decision on the application of this approach. Coordinate development work with NATO allies.

4. FY 1981 Planned Program: Complete technology demonstrations. Initiate development of a major TOW system improvement with the prime contractual effort in the United States or Europe.

5. Program to Completion: Complete development and begin production in the mid 1980's.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.15.A
DoD Mission Area: #449 - Chemical-Biological Defense
Chemical Warfare

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	150	721	2340	1654	Continuing	Not Applicable
DE76	Lethal Chemical Materiel	0	300	1740	713	Continuing	Not Applicable
DE77	Lethal Chemical Agent Process	150	421	600	941	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Union of Soviet Socialist Republic (USSR) has developed a formidable chemical warfare capability which presents a threat to survival of US and NATO forces. US policy requires a chemical weapons development program which will provide deterrent and retaliatory capability. This project supports that need by providing for the transition of technology concepts into advanced development materiel. Additionally, DoD (Department of Defense) has directed that the Army be the Executive Agent for the Services' chemical warfare requirements. This necessitates a program to conduct advanced development for lethal chemical munitions. There is no other DOD program which satisfies these needs.

C. BASIS FOR FY 1980 RDTE REQUEST: To evaluate a 155mm artillery projectile with a binary lethal intermediate volatility agent (IVA) payload and a binary lethal agent warhead for the Ground Support Rocket System (GSRS). Additionally, supportive chemical process design and pilot production studies will be implemented.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiate Advanced Development (AD) on 155mm Binary IVA Projectile	1QFY80	Not Shown
Complete AD on 155mm Binary IVA Projectile	2QFY81	Not Shown
Resume AD on GSRS Lethal Binary Warhead	1QFY80	Not Shown
Complete AD on GSRS Lethal Binary Warhead	2QFY82	Not Shown

Program Element: #6.36.15.A
DoD Mission Area: #449 - Chemical-Biological Defense Chemical Warfare

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	268	721	1353	Continuing	Not Applicable

The increase in funds requested for FY 1980 will permit the conduct of an accelerated program to complete advanced development of the 155mm Binary Intermediate volatility agent (IVA) projectile and the Ground Support Rocket System (GSRS) Binary Warhead by FY 1982.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.15.A
DoD Mission Area: #449 - Chemical-Biological Defense Chemical Warfare

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to conduct advanced development on binary lethal chemical agent munitions which have advanced from exploratory development and exhibit potential for casualty production through either the respiratory tract and/or penetration of environmental and protective clothing. Small-scale pilot units are designed and installed to obtain process engineering data for application to future production facilities. Chemical agent munitions concepts that employ the binary principle are evaluated.

G. RELATED ACTIVITIES: No comparable work is done by the other Services on lethal chemical agent processes. Each of the other Services sponsor engineering development on lethal chemical agent weapons unique to its requirements. Information is exchanged and the efforts are coordinated through exchange of technical documents, liaison officers, and by joint technical coordinating groups. Exploratory work leading to this advanced development effort was conducted under program element/project 6.26.22/A554 - "Chemical Munitions and Chemical Combat Support."

H. WORK PERFORMED BY: US Army Chemical Systems Laboratory, Edgewood, MD, which is the in-house Army developer for lethal chemical agent munitions; the US Army Test & Evaluation Command (TECOM), at Aberdeen Proving Ground, MD; and Dugway Proving Grounds, Dugway, UT. Chemical Systems Laboratory performs all toxic chemical agent development work for the Department of Defense.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Data developed in the lethal chemical agent processes project were used in construction of chemical agent production facilities at Rocky Mountain Arsenal, CO, and Newport Ammunition Plant, IN. Procedures for designing equipment for filling, closing, and leak testing of chemical munitions were developed. Production techniques for lethal binary chemical agent non-toxic intermediates were studied and small quantities of some intermediates were prepared. Studies were conducted on submunition concepts for missile warhead applications. In FY 1970 advanced development was initiated on the binary GB 155mm projectile. In FY 1971, process chemistry studies for production of the binary intermediates for GB were completed and prototype filling and sealing equipment for the binary GB 155mm projectile was developed. In FY 1972, advanced development was completed on the 155mm binary GB projectile. In FY 1973, advanced development was initiated on the binary VX 8-inch projectile. Process studies for the production of binary VX were initiated. In FY 1974, advanced development on the binary lethal chemical agent 8-inch projectile was completed. Process studies and pilot production studies for binary intermediates were continued. Sub-pilot investigation of binary VX components disposal by means of incineration was conducted and feasibility was demonstrated. Criteria were developed for a pilot filling machine for loading of the binary VX 8-inch projectile, and the Development Test II (DT II) hardware filling line was completed early in FY 1974. Basic design parameters based on DT II hardware were made available for subsequent production design. In FY 1975, the exploratory development efforts on a binary intermediate volatility agent

project, air-to-ground munitions, and missile and rocket warheads were closely monitored to provide the design base for advanced development effort. Design criteria for a pilot filling line for the 8-inch binary VX projectile was completed. Process and pilot production evaluations continued. In FY 1976, effort was initiated to determine feasibility of a binary lethal chemical agent warhead for the Ground Support Rocket System (GSRS). Evaluation of the lethal agent warhead for the GSRS continued during FY 1977 with emphasis on dynamic flight testing of the proposed design. Also, during FY 1977, chemical process and pilot production efforts continued relative to the binary VX 8-inch projectile program. No advanced development of GSRS binary warheads was conducted in FY 1978.

2. FY 1979 Program: Funds will support advanced development for intermediate volatility agent (IVA) weapon system development. Additionally, funds will support binary agent manufacturing process efforts and pilot plant production efforts.

3. FY 1980 Planned Program: Initiate advanced development of the 155mm binary intermediate voltility agent (IVA) projectile. This includes: refining the exploratory development design; fabrication of hardware and conduct of a cost/operational analysis. Resume advanced development of the GSRS binary warhead by conducting developmental tests to identify and resolve any developmental problems; preparation of Development Test I/Operational Test I (DT I/OT I) plans and a cost/operational effectiveness analysis. Supporting chemical process design and pilot production studies will continue with respect to both munitions. These studies support the development of appropriate production procedures for chemical intermediates and techniques/procedures for fill, close, seal, and leak detection to support binary munitions development.

4. FY 1981 Planned Program: Complete advanced development of the 155mm binary letal IVA projectile and intermediates waste streams disposal procedures; develop prototype fill and close stations for the 155mm binary IVA and GSRS binary warhead; continue advanced development of the GSRS binary warhead.

5. Program to Completion: Advanced development of the 155mm binary IVA projectile will be completed in FY 1981. Advanced development of the GSRS binary warhead will be completed with conduct of Development Test I/Operational Test I (DT I/OT I) in FY 1982. Chemical process design and pilot production studies will continue to support other binary munitions development.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.19.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	300	812	2150	5000	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D606	Countermine and Barrier Systems	300	812	2150	5000	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Soviet and WARSAW PACT doctrine advocates the large scale use of land mines in both offensive and defensive operations. In support of this doctrine, the Soviets have developed mechanized devices which rapidly lay minefields having a variety of complex mine fuzes. Mutually supporting countermine devices and techniques are required to meet the threat. The objective of this program element is to improve the Army countermine capabilities by investigating countermine equipment prototypes which aid in the maintenance of battlefield mobility. Additionally, concepts on advanced barrier techniques to reduce the logistic burden normally associated with barrier systems are investigated. A comprehensive system of barriers is required to significantly reduce the capabilities of massed Soviet armored forces. Improved field fortifications techniques are devised and evaluated to improve battlefield survivability of friendly forces by hardening tactical positions. This is necessitated by improved threat ammunitions effectiveness.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue advanced development on the magnetic signature duplicator and the portable mine neutralization system (POMINS). Initiate advanced development on sprayed fuel-air explosives and pyrophorics. Initiate efforts on prototypes of advanced barrier systems and field fortifications.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)*	800	828	1357	Continuing	Not Applicable

* In FY 1979 submission, this profile was shown in Program Element 6.36.19.A/D606.

Program Element: #6.36.19.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

In FY 1978, reduction in funds actually expended reflects movement of funds to higher priority Army requirements. In FY 1979, decrease in funds required reflects an improvement in cost estimates. In FY 80, increased requirements for funds reflects revised cost estimates based on more sophisticated user requirements.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.19.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program element provides for prototype testing of countermine concepts developed in Program Elements 6.27.33.A, Mobility Equipment Technology, and 6.36.18.A, Countermine and Barriers Developments. The goal is to provide the Army with a family of mutually supporting countermine devices and techniques to meet the identified threat. The challenge of mine detection and neutralization has proven to be highly complex if the momentum of the attack is to be maintained. Detection must be accomplished rapidly and remotely if possible. Neutralization must be highly reliable and from a standoff position in many instances.

G. RELATED ACTIVITIES: Exploratory development for this program is conducted in Program Element 6.27.33.A, Mobility Equipment Technology. Advanced techniques and components are developed in Program Element 6.36.18.A, Countermine and Barrier Developments. Engineering development efforts which result from this program are accomplished in Program Element 6.46.12.A, Countermine and Barriers. Countermine efforts are closely coordinated with the Project Manager for Selected Ammunition, Dover, NJ, who is responsible for the Army Mine Program.

H. WORK PERFORMED BY: The US Army Mobility Equipment Research and Development Command, Fort Belvoir, VA, is assigned responsibility for Countermine and Barriers. In-house efforts are performed by the US Army Test and Evaluation Command, Aberdeen, MD. Contractors include: Honeywell, Incoroporated, Hopkins, MN, and Martin-Marietta, Orlando, FL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Advanced development was completed on the Surface Launched Unit, Fuel-air Explosive (SLUFAE) Mine Neutralization System, the vehicle mounted road mine detector, the mine clearing roller, and the mine clearing plow.

2. FY 1979 Program: Continue advanced development on a portable projected line charge for antipersonnel minefields and barbed wire portable mine neutralization system (POMINS) and a vehicle magnetic signature duplicator (VEMASID) to counter magnetic influence fuzes.

3. FY 1980 Planned Program: Completed advanced development on the portable projected line charge and the vehicle magnetic signature duplicator.

4. FY 1981 Planned Program: Initiate advanced development on improved fuel-air explosives. Continue advanced development on improved tactical shelters to improve battlefield survivability.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.23.A
DoD Mission Area: #416 - Landmine Warfare

Title: Landmine Systems
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	2240	4128	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D005	Mine Systems	0	0	2240	4128	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for the advanced development of new mine systems. Mines provide a formidable obstacle to the massive tank threat posed by the Warsaw Pact. Mines are required to fortify natural obstacles such as defiles, woods, rivers, and built-up areas in order to delay, canalize, and interdict attacking forces and enhance the performance of direct and indirect fire weapons. Mine components such as sensors, fuzes, logic networks, and power sources are assembled into prototype systems and tested under this program element.

C. BASIS FOR FY 1980 RDTE REQUEST: Initiate advanced development of a horizontal action off-route antitank/antivehicular mine for use along roads and trails and an improved conventional mine using components from the scatterable mine program to reduce size and weight.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: This is a new program element in FY 1980.

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.36.23.A
DoD Mission Area: #416 - Landmine Warfare

Title: Landmine Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: For some years, the Army has been in the process of developing and fielding a family of scatterable mines (FASCAM). These small highly lethal mines are configured for delivery by various means including helicopters, artillery, ground dispenser, and manportable modular pack. Development on new mines begins by addressing the components which make up the mine, i.e., lethal mechanisms, fuze, logic network, power sources, and potential configuration. Once these components can be configured into a prototype the mine is then treated as a system and is transferred from Program Element 6.36.06.A, Landmine Warfare to 6.36.23.A, Landmine Systems. Three mines are currently included in this category: a horizontal action off-route mine for use along roads and trails to enhance other obstacles; an improved conventional mine for hand emplacement which takes advantage of the features associated with the scatterable mines; and an underwater mine to enhance river obstacles.

G. RELATED ACTIVITIES: Component work for Landmine Systems takes place in Program Element 6.36.06.A, Landmine Warfare and Engineering Development takes place in Program Element 6.46.19.A, Landmine Warfare. Developmental information is coordinated and exchanged between the Services by the Tri-Service Joint Technical Coordinating Group for Bombs, Mines, and Clusters. The Department of Defense Armaments Munitions Requirements and Development Committee monitors the scatterable mine program with a view towards avoiding Service duplication. Countermine efforts under Program Elements 6.36.19.A and 6.46.12.A, Countermine and Barriers are reviewed on a continuing basis to incorporate necessary counter-countermeasures if applicable.

H. WORK PERFORMED BY: The Project Manager for Selected Ammunition, US Army Armaments Research and Development Command (ARRADCOM), Dover, NJ, is responsible for management of Landmine Warfare systems and components. Other in-house efforts are provided by: The Army Materiel Systems Analysis Agency, Aberdeen, MD; and the US Army Mobility Equipment Research and Development Command, Fort Belvoir, VA. Contractors include: Hughes Aircraft, Fullerton, CA; Honeywell, Incorporated, Hopkins, MN; and Aircraft Ordnance and Manufacturing Company, Downey, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not applicable.

2. FY 1979 Program: Not applicable.

3. FY 1980 Planned Program: Initiate advanced development on a horizontal action off-route antitank/antivehicular mine and improved conventional hand emplaced antipersonnel and antitank mines using FASCAM components.

4. FY 1981 Planned Program: Continue advanced development on a horizontal action mine and improved conventional mines.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.24.A Title: Mobility
DoD Mission Area: #442 - Logistics/General Combat Support Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	98	300	0	0	398
	QUANTITIES						Not Applicable
DH64	High Mobility Tactical Vehicle	0	98	300	0	0	398

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports Army requirements for an 8-10 ton expanded mobility truck able to resupply Artillery and Armor units with ammunition and other vital supplies that must be moved forward to units in contact. These vehicles provide the cargo carrying capability needed by a modern Army to transport vital supplies to support continued combat operations. The mobility of these expanded mobility tactical vehicles must approach that of armored vehicles and specialized vehicles such as the COER. These vehicles must, in addition to providing this off-road mobility, be able to maintain high rates of speed in wheeled convoys. The increased mobility provided by this vehicle will enable US forces to keep pace with similar vehicles of our allies. These Army needs are met through the development and testing of conceptual and experimental test-bed tactical vehicles assigned to satisfy future Army requirements for logistical and other combat support vehicles through innovative integration of commercially available components.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds requested provide for establishment of a procurement baseline for a 10-ton high mobility tactical truck that will be used for various tactical missions. Specifications will also be developed to define the vehicle technical characteristics and performance requirements.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Completion of Technical Data Package	4Q FY80	Not Shown

Program Element: #6.36.24.A Title: Mobility
DoD Mission Area: #442 - Logistics/General Combat Support Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	0	1753	10240	Continuing	Not Applicable

Explanation of Funding Changes: The change in funding reflects the restructuring of this program by assigning Project DH17, High Mobility Weapons Carrier, to Program Element (PE) 6.46.24.A, High Mobility Weapons Carrier, and Project D154, Vehicle Rearm System, to PE 6.36.32.A, Armored Combat Support Vehicle Family.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:						
Funds (current requirements)	0	0	16600	0	0	16600
Quantities (current requirements)	0	0	108	0	0	108

Procurement funding shown in FY79 submission was for the High Mobility Weapons Carrier now carried in PE 6.46.24.A.

Program Element: #6.36.24.A Title: Mobility
DoD Mission Area: #442 - Logistics/General Combat Support Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Army has a continuing requirement for tactical support vehicles. This program provides future tactical support vehicles through a low risk and low leadtime approach by the integration of commercially available components.

G. RELATED ACTIVITIES: This program is related to all of the Army's research and development programs connected with tactical and special purpose vehicles. Programs of primary interest are: Program Element (PE) 6.26.01.A, Tank and Automotive Technology; PE 6.11.02.A, Research in Vehicle Mobility; PE 6.21.05.A, Materials; PE 6.36.32.A, Armored Combat Vehicle Support Family; PE 6.46.24.A, High Mobility Weapons Carrier. Duplication of effort is avoided by review and coordination of programs at all Army management levels.

H. WORK PERFORMED BY: US Army Tank and Automotive Research and Development Command, Warren, MI. Contractors will be selected April 1980.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not Applicable.

2. FY 1979 Program: The 10-ton expanded mobility tactical truck test bed fabricated by PACCAR will complete evaluation at the US Army's Test and Evaluation Command at Aberdeen Proving Ground.

3. FY 1980 Planned Program: A procurement baseline will be established for the purchase of a 10-ton tactical truck. This will include the development of specifications to define the vehicle technical characteristics and performance requirements.

4. FY 1981 Planned Program: Not Applicable.

5. Program to Completion: Not Applicable.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.27.A
Title: Combat Support Munitions
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2665	2346	2620	5231	Continuing	Not Applicable
	QUANTITIES						Not Applicable
DE78	Tactical Riot Control Agents and Munitions	0	0	0	200	Continuing	Not Applicable
DE79	Civil Disturbance/Internal Security Systems	0	0	0	1140	Continuing	Not Applicable
DE82	Smoke Munitions and Material	2665	2346	2620	3891	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is required for advanced development, investigation and evaluation of smoke material and munitions, and of riot control agent (RCA) munitions/systems for tactical and civil disturbance use. New and significantly improved smoke/obscurant systems are required to protect US forces from advanced Soviet electro-optical devices which operate across the electromagnetic spectrum (from visible to the radar region). The currently fielded US Army smoke systems were developed before and during World War II and are not capable of rapidly providing the broadband screening for the required length of time for our armored vehicles, critical installations, assembling forces, and logistical complexes to survive on the modern battlefield. The US has reserved the right to use riot control agents (RCA) in war in defensive military modes in order to save lives. Also the US Army requires RCA systems to properly perform its civil disturbance mission. These RCA missions require the development of munitions and systems for rescue operations, to protect rear area convoys, for POW riot situations and for civil disturbance situations.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds are needed to continue advanced development (AD) of prototype large area screening systems. Funds are also needed to begin AD of promising combat vehicle rapid smoke systems that will screen/obscure in the infrared portion of the electromagnetic spectrum. These efforts are necessary to provide for armored vehicle survivability and for timely and effective large force, installation, and logistical complex screening on a modern battlefield.

Program Element: #6.36.27.A
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare

Title: Combat Support Munitions
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	1985	2346	3528	Continuing	Not Applicable

Since no requirements currently exist for a smoke warhead for the GSRS, nor for a 105mm smoke projectile, these tasks and $908K were deleted from FY 1980 for 6.36.27.A/Project DE82; the FY 1978 change of +$679K was the result of two funding changes within Project DE82. First, the funding for advanced development (AD) of the 155mm smoke projectile was increased to extend AD through the 4QFY78; and secondly, the effort to develop an improved 81mm mortar smoke cartridge was significantly reduced. The combination of these two changes resulted in a net +$679K change to DE82 in FY78.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.27.A
Title: Combat Support Munitions
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to conduct advanced development (AD) of new and improved smoke munitions and material, and riot control agent (RCA) tactical and civil disturbance items. Current emphasis is on the advanced development of improved smoke systems for all combat vehicles that screen in the infrared as well as the visible spectrum and on large area screening systems.

G. RELATED ACTIVITIES: This program is supported by Program Elements (PE's) 6.26.22.A, Chemical Munitions and Chemical Combat Support; 6.46.01, Infantry Support Weapons; and 6.46.09, Combat Support Systems. In order to meet other Service needs and to insure that unnecessary duplication of effort does not occur, liaison personnel from each Service monitor the developing agency programs and a joint smoke committee meets regularly.

H. WORK PERFORMED BY: In-house work by US Army Armaments Research and Development Command, Dover, NJ. Contractors are Battelle Corporation, Columbus, OH; and others to be determined.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Under Program Element 6.26.22.A, a concept of improved screening materials and munitions was developed and demonstrated in August 1975. Work was done at Chemical Systems Laboratory, Edgewood, MD on the use of wicks embedded in white phosphorous (WP) to improve the burning characteristics and smoke generation capability of 155 WP WICK projectiles. Because of in-flight instability problems the program was reoriented to a competitive advanced development program between red phosphorus (RP) and white phosphorus (WP). In FY 197T, a contract was awarded to Buck, KG, Germany, to fill 81mm mortar shells with a RP mixture. In FY 1977, AD was initiated on an improved 81mm Mortar Smoke Rounds under Program Element 6.36.27.A. Also, competitive AD commenced on the 155mm WP and RP Smoke Projectiles with the best design to be selected for competition during Development Test (DT) I/Operational Test (OT) I. Competitive AD between the two projectiles was terminated in 4QFY77 when the WP WICK projectile demonstrated instability in flight. Another WP fill design (XM825) prototype was developed in FY78 and AD competition continued. AD on new WP and RP submunitions for the 155mm Artillery projectiles was completed in FY78. DT I/OT I for 155mm artillery projectile was completed in FY78 and the XM825 prototype was chosen to go into engineering development (ED). This technology from the AD of an improved 155mm smoke projectile is now being utilized in the development of improved 81mm smoke cartridges.

2. FY 1979 Program: Complete competitive testing of "ballistic match" versus "maximum screening" prototype 81mm mortar cartridges. Initiate procurement of hardware for 81mm mortar smoke cartridge DT I/OT I. Conduct field tests of candidate dissemination units for a manportable smoke/obscurants generating system (an element of the large area screening system).

Program Element: #6.36.27.A
Title: Combat Support Munitions
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Complete engineering design, tests, selection of prototype design and fabrication of Development Test I/Operational Test I (DT I/OT I) hardware for selected manportable smoke obscurants generating system dissemination units. Design, fabricate and bench test a prototype infrared (IR) defeating smoke generating system for combat vehicles. Conduct feasibility testing and initiate design of DT I/OT I hardware for an IR defeating grenade system.

4. FY 1981 Planned Program: Continue advanced development of manportable smoke/obscurants generating system, and the infrared (IR) defeating smoke generating system and for the IR defeating grenade system for combat vehicles. Also conduct DT I/OT I for each of these 3 systems.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.28.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands):

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3430	9173	5200	14311	Continuing	Not Applicable
D007	Field Artillery Ammunition	3074	6842	3100	6376	Continuing	Not Applicable
D276	Improved Conventional Ammunition	356	2331	2100	7935	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports design and development of more effective munitions for Field Artillery Systems to offset the advantages in range and numbers currently enjoyed by Warsaw Pact artillery forces. One objective is to develop improved approaches to cannon, propelling charge, and projectile design in the gun propulsion technology program that will provide significantly increased range capability and enable US artillery to compete with and survive against Soviet forces. Additionally, selected munitions are being developed to improve projectile terminal effects to offset the numerical advantage of Warsaw Pact forces. These include random time delay submunitions to provide a suppressive fire capability against enemy artillery, and the Sense and Destroy Armor Munition (SADARM) an artillery delivered submunition to provide a passive anti-tank fire and forget capability to artillery forces. Efforts are continuing to improve projectile lethality and reduce sensitivity by using Composition B explosive fill in lieu of TNT, and to reduce annual training ammunition costs by developing low cost training projectiles.

C. BASIS FOR FY 1980 RDTE REQUEST: To provide for: Development of inexpensive indirect fire mortar and artillery training projectiles; continuation of the gun propulsion technology program initiated in FY 1978; advanced development of the Sense and Destroy Armor Munition (SADARM); and development of a random time delay submunition.

Program Element: #6.36.28.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	3970	7473	9514	Continuing	Not Applicable

A significant difference is in project D007 for FY 1979 which reflects Congressional action during the FY 1979 Army budget considerations where $1700K was transfered from the ammunition Procurement, Army Appropriation to the RDTE appropriation to conduct the Composition B improvement program which is an effort to reduce the sensitivity of Composition B filled projectiles. Reduction in FY 1978 funding reflects adjustments to program costs. Reduction in FY 1980 reflects decision not to pursue the multipurpose submunition development effort and the XM711, 8-inch high explosive projectile.

E. OTHER APPROPRIATION FUNDS: ($ in thousands): Not Applicable.

F. DETAILED BACKGROUND AND DESCRIPTION: This program supports two projects in munitions advanced development. Project D007 Field Artillery Ammunition development provides for: Development of thick-walled inert artillery training projectiles and concrete filled plastic mortar training projectiles for low cost, realistic training with significant avoidance of training ammunition costs; and a gun propulsion technology program which will develop improved approaches to the design of ammunition through integration of the component technologies of propellant development, ignition, projectile/tube interactions and cannon tube wear and erosion. Project D276 Improved Conventional Ammunition will support advanced development of the Sense and Destroy Armor Munition (SADARM) to provide a fire and forget antitank capability to the field artillery system. The SADARM is a carrier projectile containing three submunitions, each equipped with a parachute, lethal mechanism, and sensor. Upon ejection, the parachute stabilizes the submunition and imparts a spin to provide a scanning capability for the sensor which activates the lethal mechanism when a target is sensed at the appropriate range. Additionally, development will continue of a random time delay submunition to provide a new capability to suppress enemy artillery fire or deny terrain for an extended period of time without a continuous expenditure of ammunition.

G. RELATED ACTIVITIES: The development items in this program are directly related to exploratory research being done in Program Element 6.26.03.A, Large Caliber & Nuclear Technology. Follow-on engineering development is conducted in Program Elements: 6.46.05, Field Artillery Weapons and Ammunition, 105mm; 6.46.14.A, Field Artillery Weapons and Ammunition, 155mm; and 6.46.28.A, Indirect Fire Training Munitions. Developments in this program element are compatible with US Marine Corps requirements and

are coordinated to preclude duplication of effort. Prior to FY 1979, work now done under project D008, in Program Element 6.36.29.A Field Artillery Cannon System was conducted in this program element. Ammunition development conducted in this PE is closely coordinated with all development in PE 6.36.29 Field Artillery Cannon System.

H. WORK PERFORMED BY: US Army Armament Research & Development Command (ARRADCOM), Dover, NJ; Watervliet, NY; and Aberdeen, MD; Army Materiel Systems Analysis Agency, Aberdeen, MD. Contractors performing work in this area are the Chamberlain Corporation, Waterloo, IA; Aerojet Electro Systems, Azusa, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The qualification of alternate explosive fill in artillery projectiles was completed in 1977 and surveillance monitoring of climatically conditioned munitions to establish storage characteristics continued through 1978. The XM711, 8-inch High Explosive (HE) projectile developed in-house and the XM762, 8-inch HE projectile developed by the Space Research Corporation were initiated in competitive advanced development. The XM762 was terminated as a result of Congressional action and the XM711 projectile development was terminated in FY 1978 by OSD as not providing sufficient improvement over the standard M106 projectile to justify further development. In FY 1977 work was initiated on an inert 155mm artillery training projectile and a concrete filled plastic 81mm mortar training projectile, and expanded in FY 1978 to include 105mm artillery and 60mm mortars. Fuze and spotting signatures were evaluated, low cost packaging design was conducted, and 81mm concrete rounds were fabricated and tested for cartridge integrity. The range extension program to demonstrate compatibility between the M109A1 self-propelled howitzer and the M203 maximum propelling charge was initiated in project D008, now contained in program element 6.36.29, Field Artillery Cannon Systems. The gun propulsion program was initiated in FY 1978 with major technical efforts to investigate improved high energy igniters and propelling charges using high force cool burning propellants.

2. FY 1979 Program: Complete advanced development of the training projectiles and transition to engineering development in PE 6.46.28, Indirect Fire Training Munitions. The gun propulsion program will continue to investigate high energy igniters, high force cool burning propellants, and fabricate a variety of stick/stack charges which will be tested against tube wear requirements. A program to improve the castability of composition B and to desensitize the explosive fill will continue in an effort to qualify Composition B for use in new projectiles currently filled with TNT.

3. FY 1980 Planned Program: Complete advanced development of the 105mm artillery training projectile. Continue the gun propulsion program with investigations of refractory metal liners and coatings in 105mm and 155mm gun tubes to determine liner retention and effectiveness in improving wear, and develop combustible cases for improved handling. Contracts will be awarded to investigate several concepts of random time delay fuzing for incorporation in the design and development of an improved submunition for improved conventional munitions (ICM) projectiles. The Sense and Destroy Armor Munition (SADARM) will enter advanced development, and efforts will concentrate on development of the three major components, the warhead, parachute, and sensor.

Program Element: #6.36.28.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #4 - Tactical Programs

4. FY 1981 Planned Program: Continue advanced development of the SADARM, and complete advanced development of the random time delay submunition and transition to engineering development.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D007 — Title: Field Artillery Ammunition Development
Program Element: #6.36.28.A — Title: Field Artillery Ammunition Development
DoD Mission Area: #413 - Fire Support — Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: This project comprises two independent efforts to bridge the gap between exploratory research and engineering development of field artillery ammunition. End items currently under development are the 105mm and 8-inch low cost artillery training projectiles which will provide realistic training for artillery and mortar crewman and observers and provide significant avoidance of training ammunition costs. One advanced concept being evaluated is a plastic jacketed projectile filled with concrete, which will provide the same exterior ballistics as the high explosive (HE) round and produce upon impact a signature similar to the HE round. The current artillery training projectiles utilize thick walled, inert metal shells, which will be ballistically matched to the current high explosive projectile. In addition, a gun propulsion technology program will conduct research into the solution of current and anticipated gun propulsion problems to provide for the rational design and development of propelling charges and address the interface problems between the charge, projectile, and gun tube. This program integrates the component technologies of propellant development, ignition, and combustion, propelling charge design, propulsion diagnostics, and cannon tube wear and erosion.

B. RELATED ACTIVITIES: The gun propulsion effort is a continuation of the exploratory research being conducted in program element 6.26.03.A, Large Caliber and Nuclear Technology while the training items will continue engineering development in program element 6.46.28.A, Indirect Fire Training Munitions. The gun propulsion program's development of new propelling charges is closely coordinated with howitzer development in PE 6.36.29 Field Artillery Cannon Systems.

C. WORK PERFORMED BY: US Army Armament Research and Development Command, Dover, NJ; Rock Island, IL; Aberdeen, MD; US Army Materiel Systems Analysis Agency, Aberdeen, MD; Army Materiel and Mechanics Research Center, Watertown, MA.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The qualification of alternate explosive fills in artillery shells was completed in 1977 and Surveillance Monitoring of climatically conditioned munitions to establish storage characteristics continued through FY 1978. The XM711, 8-inch HE projectile developed in-house and the XM762, 8-inch HE projectile developed by the Space Research Corporation were initiated in competitive advanced development. The XM762 was terminated as a result of Congressional action and the XM711 development was terminated by OSD as not providing sufficient improvement over the standard M106 projectile to justify further development. In FY 1977 work was initiated on an inert 155mm artillery training projectile, XM804, and a concrete filled plastic 81mm mortar training projectile, XM798; fuze and spotting signatures were evaluated, low cost packaging design was conducted, and 81mm concrete cartridges were fabricated and tested for cartridge integrity. In 1978 development was initiated on 60mm mortar and 105mm artillery projectiles. The gun propulsion program was initiated in FY 1978 with major technical efforts to investigate improved high energy igniters and propelling charges using high-force, cool-burning propellants.

Project: #D007 — Title: Field Artillery Ammunition Development
Program Element: #6.36.28.A — Title: Field Artillery Ammunition Development
DoD Mission Area: #413 - Fire Support — Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Complete advanced development of the training projectiles and transition to engineering development in PE 6.46.28, Indirect Fire Training Munitions. The gun propulsion program will continue to investigate high energy igniters, high-force, cool-burning propellants and fabricate a variety of stick/stack charges which will be tested against tube wear requirements. A program to improve the castability of composition B and to desensitize the explosive fill will continue in an effort to qualify Composition B for use in new projectiles currently filled with TNT.

3. FY 1980 Planned Program: Complete advanced development of the 105mm artillery training projectile. Continue the gun propulsion program with investigations of refractory metal liners and coatings in 105mm and 155mm gun tubes to determine liner retention and effectiveness in improving tube wear and erosion, and develop combustible cases for improved handling. Initiate testing of plastic rotating bands and thin walled projectiles.

4. FY 1981 Planned Program: Concentrate on the design, fabrication, and evaluation of new propelling charges such as consolidated charges which permit the use of cool propellant at higher loading densities and modular charges for zone simplification. Complete combustible case charger design and conduct evaluations in larger caliber cannon. Conduct high zone firings of chemically bonded plastic rotating bands.

5. Program to Completion: This is a continuing program.

6. Major Milestones: Not Applicable

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
RDTE,A						
Funds (current requirements)	3074	6842	3100	6376	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	3589	5142	5546	N/A	Continuing	Not Applicable

The difference in FY 1979 reflects Congressional action during the FY 1979 Army budget considerations where $1700K was transferred from the ammunition procurement appropriation to the RDTE appropriation to conduct the composition B improvement program which is an effort to reduce the sensitivity of Composition B filled projectiles. Other changes reflect adjustments to program costs. FY 1980 reduction reflects the decision not to continue the XM711, 8-inch high explosive projectile development.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.29.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1687	2835	3306	8800	Continuing	Not Applicable
D008	Medium and Heavy Artillery Weapons	1687	2835	2306	7800	Continuing	Not Applicable
D285	Field Artillery Cannon (NATO)	0	0	1000	1000	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program is to support nonsystem advanced development and technical demonstrations of artillery cannon systems and associated fire control subsystems. The Army has a continuing need to increase the quality of its artillery systems to counter the quantitatively superior Soviet artillery force. This program will bring exploratory technology into test beds, resulting in proven components and concepts which will be incorporated into present and future Army artillery systems and will reduce future development costs and times for new systems.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds for Project D008 are required to integrate the technology developed in the Advanced Howitzer Test Beds and field artillery systems technology, proven in the exploratory development phase, into an advanced technology demonstrator, and to complete competitive contractor study efforts, initiated in FY 1979, for concept definition and concept formulation of an improved artillery system. Funds for Project D285 are dedicated to continuing data exchanges with NATO countries (Germany, United Kingdom, and Italy) which are developing the SP70, a SP 155mm howitzer for fielding in 1987 time frame. No milestones are shown in the FY 1979 Congressional Descriptive Summary for Project D008. In Project D285, major milestones shown in the FY 1979 Congressional Descriptive Summary were nullified as a result of Congressional deletion of the FY 1979 budget request.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE Funds (as shown in FY 1979 submission)	1867	7835	8333	Continuing	Not Applicable

Difference in the FY 1978 funding is due to the reallocation of funds to higher priority projects. Differences in the FY 1979 funding are due to Congressional denial of funds for Project D285. The reduction in the FY 1980 funding request reflects a revision to the development plans for Project D008.

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.36.29.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Field artillery system development focus is on development of technology to provide revolutionary, improved capabilities of current field artillery self-propelled howitzer systems. The innovations developed during the Human Engineering Laboratory Battalion Artillery Test (HELBAT) series will be coupled with proven civilian industry and military technology to provide the Army with an improved system for the 1990 time frame which will be qualitatively superior to the anticipated Soviet artillery force. Technological improvements in reliability, availability, maintainability, responsiveness, manpower utilization, survivability, accuracy, and increased range are being investigated for potential application to current or new systems. Civilian and military proposals for systems concept definition and formulation will be evaluated to determine feasibility and cost effectiveness of the application of new technology. Data exchange with NATO (North Atlantic Treaty Organization) countries will continue in order to identify and monitor their technological developments for evaluation and consideration for potential application to US systems.

G. RELATED ACTIVITIES: The projects in this program are related to program elements 6.26.03.A (AH18) where weapons exploratory work is performed, 6.27.02.E where the Defense Advanced Research Project Agency is developing an Advanced Artillery Technology Demonstrator, 6.35.28.A where Field Artillery Ammunition Development is accomplished, 6.33.06.A where new seeker technology with potential application to Artillery Systems is being investigated, 6.46.21.A where engineering development of the COPPERHEAD projectile is being finalized, 6.46.03.A where engineering development of an Improved 155mm Nuclear Projectile is underway, 6.46.14.A where field artillery ammunition engineering and Rationalization, Standardization, and Interoperability efforts are being pursued.

H. WORK PERFORMED BY: Specific contractors for contracts to be awarded in FY 1979 and continuing in FY 1980 have not been determined. In-house developing organizations participating in the program are: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, Edgewood, MD, Aberdeen, MD, and Watervliet, NY; Army Materiel Systems Analysis Activity (AMSAA), Aberdeen, MD; Defense Advanced Research Projects Agency (DARPA), Arlington, VA; US Army Test and Evaluation Command (TECOM), Aberdeen, MD; US Army Operational Test and Evaluation Agency (OTEA), Falls Church, VA; US Army Field Artillery Board (USAFAB), Fort Sill, OK; US Army Field Artillery School (USAFAS), Fort Sill, OK; US Army Training and Doctrine Command (TRADOC), Fort Monroe, VA; US Army Tank Automotive Research and Development Command (TARADCOM), Warren, MI; and US Army Armament Materiel Readiness Command (ARMCOM), Rock Island, IL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: From FY 1976 to the present, bulk of this program funding has been used to provide an extended range capability for the M109 series, 155mm self-propelled howitzers. To date, this effort has provided for additional range coverage of the existing howitzer and the developmental COPPERHEAD projectile and will ultimately result in the achievement of a full 30km range capability by providing compatibility with the M203 propelling charge and M549 rocket assisted projectile. Programs for FADAC (Field Artillery Digital Automatic Computer) system were updated to support the fielding of new weapons and new ammunition items.

2. FY 1979 Program: Ammunition compatibility testing will continue in order to provide an extended range capability for the M109 series 155mm SP howitzer. Update of FADAC (Field Artillery Digital Automatic Computer) tapes will continue to support fielding of new ammunition and extended range M109. In FY 1979 contracts will be awarded to multiple competitors for concept definition and concept formulation of an improved artillery system. Contractors will be tasked to generate system descriptions and provide supporting analyses and technical details to demonstrate the cost effectiveness of their proposed approaches. This data will be provided to a US Army user/developer study group for evaluation. Prior to the award of contracts, supporting analysis will be done in-house to generate an independent assessment of system need and goals as well as to provide a basis for evaluating contractor proposals. Resulting analytic tools developed will be made available to competing contractors for their use in measuring effectiveness of conceptual approaches.

3. FY 1980 Planned Program: Assessment of the results of technological developments demonstrated on Howitzer Test Beds 1 and 2 during Human Engineering Laboratory Battalion Artillery Test (HELBAT) 7 (January - March 1979) coupled with an evaluation of industry proposals for system concept definition and available advanced technology will form the basis for the initiation of design and fabrication of major components leading to an advanced technology demonstrator for improving or replacing the current self-propelled howitzer system. Data exchange with NATO countries will continue in an effort to monitor technological developments of the SP 70 155mm SP howitzer.

4. FY 1981 Planned Program: The most promising concept(s) developed during FY 1979-1980 will be selected for further evaluation. Procurement of technology demonstrator hardware will be initiated, including both high technology componentry, and one or more system concept demonstrators.

5. Program to Completion: Fabrication and evaluation of technology demonstrators will continue.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.32.A
Title: Armored Combat Support Vehicle Family
DoD Mission Area: #442 - Logistics/General Combat Support
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	302	4400	7300	17800	32100
	QUANTITIES						6
D154	Armored Combat Support Vehicle Family	0	302	4400	7300	17800	32100

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army has a need for armored combat support vehicles to meet four essential, logistics roles and missions. The principle requirement of each role and mission is:

a. Armored Forward Area Resupply Vehicles (AFARV). To resupply tank ammunition to forward deployed and engaged tank forces on position in an environment of suppressive artillery fires.

b. Armored Artillery Resupply Vehicle (AARV). To provide a continuous supply of artillery ammunition to self-propelled artillery guns which are subject to counter battery fires from enemy rocket and cannon fires.

c. Maintenance Assist Vehicle (MAV). To provide maintenance, including large component repair and replacement, spare parts, welding, flame cutting, power tools and; light track retrieval and lift capability. The MAV will execute these functions at the site of disabled tracked combat vehicles in the forward battle area.

d. Medical Evacuation Vehicle (MEV). To provide protected, mobile, facilities for patient treatment on the battlefield and continued care during transport to medical treatment units in the rear.

C. BASIS FOR FY 1980 RDTE REQUEST: Using the General Support Rocket System (GSRS) chassis, unchanged, develop protected ammunition modules, including materiel handling equipment, for carrying tank and artillery ammunition. Procure two chassis and six modules, three for the tank resupply mission and three for the artillery resupply mission. Initiate Operational Testing/ Development Testing II (OT/DT II) testing to optimize both resupply module configurations and determine the optimum force density distribution which best provides tank and artillery ammunition resupply for armored and mechanized divisions.

Program Element: #6.36.32.A
DoD Mission Area: #422 - Logistics/General Combat Support

Title: Armored Combat Support Vehicle Family
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Armored Forward Area Rearm Vehicle (AFARV) and Armored Artillery Resupply Vehicle (AARV):		
Release Request for Proposal (RFP)	1QFY1980	None Shown in FY 1979 Submission
Award AFARV Contract	2QFY1980	
Complete AFARV Development Test/Operational Test II (DT/OT II)	1QFY1982	
Complete AARV DT/OT II	3QFY82	
Type Classify AFARV Module	2QFY82	
Type Classify AARV Module	4QFY82	

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands):

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	0	300	5740	2423	11163

The Armored Combat Support Vehicle Family project is an outgrowth of the 63624/D154 Vehicle Rearm System Project. The funding profile for the Vehicle Rearm System, as displayed in the FY 1979 Congressional Descriptive Summary, is shown above. Differences reflect a restructuring and expansion of the original Vehicle Rearm System project.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.36.32.A
Title: Armored Combat Support Vehicle Family
DoD Mission Area: #442 - Logistics/General Combat Support
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In order to win ground combat against enemy mechanized forces which are numerically superior, US tanks, artillery, and other fighting vehicles must sustain combat at higher intensities for longer periods than ever before. Front line logistical support becomes the buttress of sustaining these combat operations. Vehicles required for this support must have protection against small arms and overhead artillery fires and cross-country mobility comparable to the tracked combat vehicles they support. Resupply of tank and artillery ammunition to the combat site for on-position resupply, maintenance and emergency combat repair, and battlefield evacuation of wounded are the essential elements of the increased logistical demand. There are four current logistical roles and missions which demand increased capabilities. The first priority development is an armored resupply vehicle designed specifically to resupply tanks which are engaged in combat in the forward battle area. The second priority development is an armored artillery resupply vehicle designed to couple with self-propelled howitzers for sustained firing engagements in a counterbattery environment. The Army will initiate the development of the first two priorities in FY 1980. Taking the General Support Rocket System (GSRS) chassis as the basic carrier, because it provides cross-country mobility and protection from small arms and splintering munitions, the program will develop armored modules in which to carry ammunition, and attendant on-board materiel handling equipment. There is no intent in this program to develop a new tracked combat vehicle. In subsequent years, the Army will initiate the Maintenance Assist Vehicle program. The Maintenance Assist Vehicle (MAV) module will also ride on the GSRS chassis and will provide power, repair parts, tools, and vehicle retrieval necessary for maintenance operations in the forward battle area. The fourth module development is the Medical Evacuation Vehicle (MEV). Recovering wounded from damaged or destroyed combat vehicles, providing emergency medical care to stablize patients, and evacuation of casualties under fire to a safe position in the rear, require a vehicle and module designed specifically for life-saving in the combat environment. The Army will investigate the feasibility for an armored, fueling module on the GSRS chassis to satisfy a forthcoming need to refuel tracked combat vehicles, particulary tanks. To optimize total force effectiveness for all roles stated above, interchangeable modules, and modules which are integral to the chassis will be evaluated.

G. RELATED ACTIVITIES: This program is related to all of the Army's research and development programs connected with tactical and special purpose vehicles. Programs of primary interest are: Program Element (PE) 6.26.01.A, Tank and Automotive Technology; PE 6.11.02.A, Project AF22, Research in Vehicle Mobility; PE 6.21.05.A, Materials; PE 6.36.21.A, Vehicle Engine Development. Duplication of effort is avoided by review and coordination of programs at all Army management levels.

H. WORK PERFORMED BY: US Army Tank and Automotive Research and Development Command, Warren, MI, has the responsibility for implementation of this program. Contractors will be selected February 1980.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not Applicable.

2. FY 1979 Program: Engineering evaluation of various configurations of modules and materiel handling equipment.

Program Element: #6.36.32.A
DoD Mission Area: #442 - Logistics/General Combat Support

Title: Armored Combat Support Vehicle Family
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Initiate fabrication of three prototype Armored Forward Area Rearm Vehicle (AFARV) modules and three prototype Armored Artillery Resupply Vehicle (AARV) modules.

4. FY 1981 Planned Program: Initiate Development Test II/Operational Test II (DT II/OT II) of the AFARV and AARV modules using two General Support Rocket System (GSRS) chassis.

5. Program to Completion: Complete DT II/OT II. Type classify modules. Initiate and complete development of module for Maintenance Assist Vehicle. Initiate and complete development of module for Medical Evacuation Vehicle.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.05.A
DoD Mission Area: #447 - Physical Security

Title: Physical Security
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	200	3500	3500	3541	Continuing	Not Applicable
DE82	Physical Security	200	3500	3500	3541	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Objective is to conduct advanced development of a tri-Service family of interior physical security sensors, exterior lighting, barriers, and ancillary equipment that will operate worldwide, enabling military commanders to tailor physical security systems to protect assets, installations, bases, facilities, personnel, and the rear area of deployed forces. Physical security equipment is required to better protect weapon systems and critical areas including arms rooms and storage facilities. Significant manpower savings are practical when adequate detection systems are installed. The Department of Defense uses more than 16,000 guard personnel daily. Development is directed toward satisfying requirements for a Facility Intrusion Detection System (FIDS) and for a Fixed Installation Exterior Perimeter Sensor System (FIEPSS). All developments are aimed for satisfying tri-Service requirements.

C. BASIS FOR FY 1980 RDTE REQUEST: Accomplish advanced development of: (1) components to provide additional capabilities for the Facility Intrusion Detection System (FIDS) in full-scale development under Program Element 6.47.18.A, Physical Security; and (2) exterior lighting and barrier systems. Components will be procured and evaluated in-house to demonstrate concept feasibility. Items to be procured include a response/deterrent subsystem, cargo security and locking devices, a radio frequency (RF) data link, a covertly-activated duress sensor, a contraband sensor, and lighting and barrier components. A Validation In-Process Review will be conducted in FY80 on the first group of lighting and barrier components.

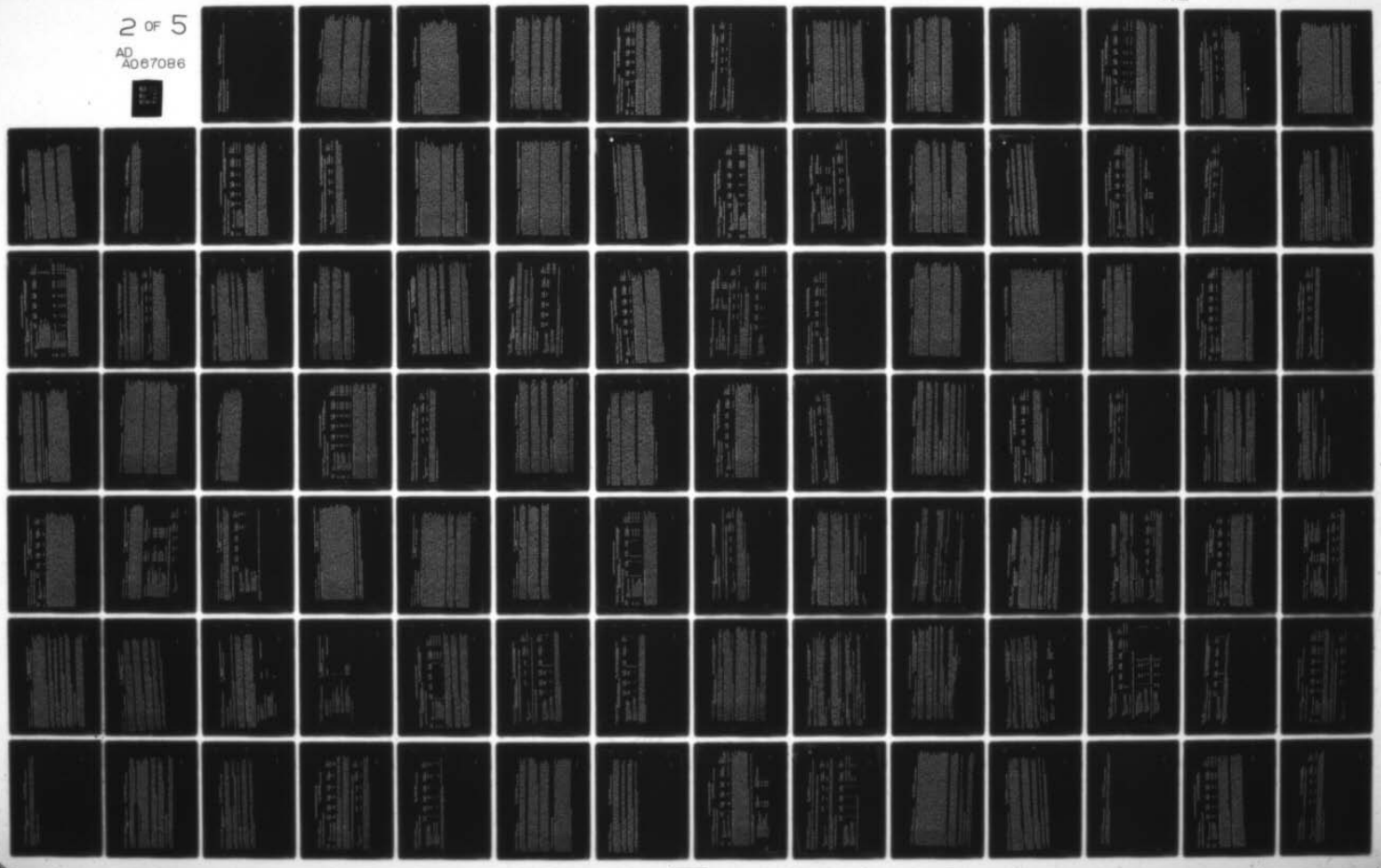
D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL BUDGET REQUESTS: ($ in thousands)

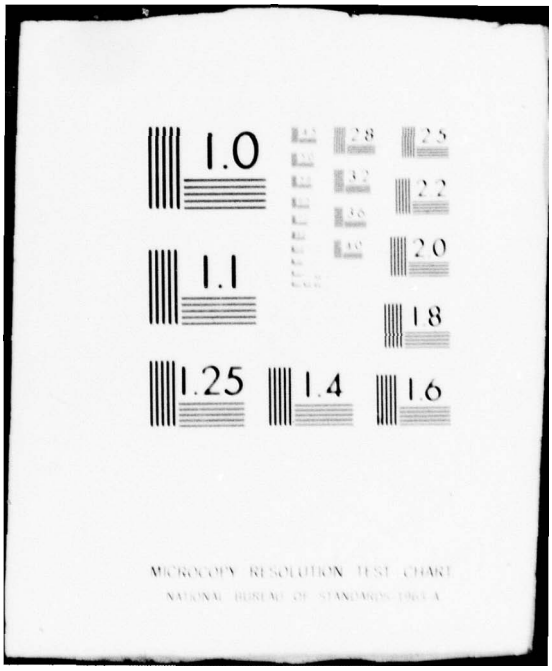
	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	0	3500	3500	Continuing	Not Applicable

AD-A067 086 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 5/1
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
JAN 79

UNCLASSIFIED NL

2 OF 5
AD A067086




1.0
1.1
1.25
1.4
1.6
2.8
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Program Element: #6.37.05.A
DoD Mission Area: #447 - Physical Security

Title: Physical Security
Budget Activity: #4 - Tactical Programs

200K increase in FY78 is due to restructuring of this program to provide continuity to the tri-Service effort of providing a complete interior/exterior system by 1983/4.

E. OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.37.05.A
DoD Mission Area: #447 - Physical Security

Title: Physical Security
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Objective is to conduct all design, development, test, and evaluation required to provide the technological base and establish the concept feasibility necessary to proceed into engineering development of complete, integrated physical security systems to protect material, bases, facilities, installations, and personnel against theft, sabotage, or espionage. Developments will be directed towards satisfying the Navy, Air Force, and Army's Materiel Need (MN) for an interior security system (Facility Intrusion Detection System (FIDS)). The approach to advanced development is to provide a DOD system overview via systems analysis. Development will include the following: (1) sensors, including penetration, motion, item removal, duress, and contraband; (2) electronic data links, data link security supervisory components, and centralized data processing components; (3) alarm display, monitoring, and readout components; (4) physiological and/or psychological deterrent devices; (5) devices to protect cargo in depots or in transit by truck or ship, (6) standardized high security weapons containers, and (7) exterior lighting and barrier systems. Interfaces necessary to integrate exterior sensors developed by the Air Force and potential shipboard security equipment components adopted by the Navy will also be developed. In addition, there will be a continuing evaluation of commercial physical security equipment as well as those items that might be developed by other government agencies.

G. RELATED ACTIVITIES: This program leads into engineering development Program Element 6.47.18.A, Physical Security. The Interim Facility Intrusion Detection System is being developed under that Program Element to provide interior intrusion detection systems to all Department of Defense (DOD) elements. Related are the Army's Remotely Monitored Battlefield Sensor System (REMBASS) tactical sensor program, and the Air Force's Base and Installation Security System (BISS) exterior physical security program. Also related is the Army's Required Operational Capability for a Fixed Installation Exterior Perimeter Sensor System (FIEPSS). It is planned to satisfy the Army exterior requirement with the BISS program. Close coordination with REMBASS and BISS is being accomplished to assure utilization of related technologies and developments and to prevent duplication of effort. Coordination is accomplished by memberships of joint working groups and by attendance at other Service and department meetings. The DOD Physical Security Equipment Action Group monitors and coordinates the development and acquisition of physical security equipment by all Services. The Department of the Army single point of contact is the Project Officer for Physical Security Equipment (POPSE), who monitors and coordinates the development, acquisition, integrated logistic support, and installation of physical security systems.

H. WORK PERFORMED BY: The US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is assigned responsibility for Physical Security Research, Development, Test and Evaluation (RDTE). Other government agencies currently involved are the US Army Test and Evaluation Command, Aberdeen, MD, and the US Army Natick Research and Development Command (NARADCOM), Natick, MA, for development of secure containers. Major contractors are LaBarge Electronics Division, Tulsa, OK; GTE Sylvania, Mountainview, CA; and Aritech, Inc., Boston, MA.

Program Element: #6.37.05.A
DoD Mission Area: #447 - Physical Security

Title: Physical Security
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Advanced development in pursuance of the approved Materiel Need for the Facility Intrusion Detection System (FIDS) was initiated during FY 1974 under Program Element (PE) 6.37.19.A, Special Purpose Detectors. A development plan was completed, concept formulation was demonstrated, and a Concept Feasibility In-Process Review was conducted in June 1974. The In-Process Review authorized full-scale development of a Basic FIDS and continuing advanced development of an Advanced FIDS. During FY 1976, an analysis of physical security requirements was conducted, including attack and threat scenarios, site functional requirements, and site parameters, to insure development of physical security systems meeting both materiel and user requirements. The engineering development models of the FIDS sensors, power supply, and control, communication, and display subsystem (CCDS) were tested and evaluated. Based upon this, the CCDS was completed, reconfigured, and rebuilt. The CCDS can interface with both military and commercial sensors. Contract solicitations were issued in FY78 for the Development Test II/Operational Test II (DT II/OT II) models. In the cargo protection area, package alarms, vehicle trackers, electronics and optical tagging techniques, and remotely activated vehicle alarms were surveyed to determine suitability for use in a Facility Intrusion Detection System. The lighting and barriers task was not funded until FY78, however, during FY77 the following was accomplished: (a) At the request of the Office of the Deputy Assistant Secretary of Defense (ODASD) (Security Policy)/the Office of the Director of Defense Research and Engineering (ODDRE)/the Office of the Deputy Chief of Staff for Research, Development, and Acquisition (ODCSRDA), a review of Commander in Chief, Europe (CINCEUR) lighting requirements was conducted, concentrating on horizontal and vertical illumination requirements 30 feet from the perimeter fence. CINCEUR was also concerned about quick (5 second) start-up lights and noninterruptible power sources. None are currently available. Final report submitted to the DCSRDA contained a proposal for a "Perimeter Lighting Evaluation Program" which is relevant to the effort projected for this task. (b) Points of contact for lighting were established at Defense Nuclear Agency (DNA), National Bureau of Standards (NBS), Energy Resources Defense Administration (ERDA), Base and Installation Security System Project Office (BISSPO), and Sandia Laboratories. Coordination was effected with these agencies. During FY78, the Military Police School initiated preparation of a Joint Services Letter of Agreement for improved lighting and barrier physical security equipment. Coordination and review was effected with the three Services to assure that their requirements will be satisfied. Available government and nongovernment test data was collected and reviewed. Preparation of the Outline Acquisition Plan and Coordinated Test Plan was initiated. In the equipment evaluation area, the major effort was in the evaluation of commercial and military equipment for use in FIDS. Countermeasure techniques were investigated and the threat reassessed.

2. FY 1979 Program: A Validation In-Process Review (VAL IPR) will be conducted for Advanced Facility Intrusion Detection System (FIDS) capabilities prior to initiating engineering development of: video surveillance device, identification element interface cards, remote display capabilities, large and small control, communication, and display subsystem (CCDS), portable duress sensor, reconfigured Large Area Motion Sensor, physiological deterrent, and Base and Installation Security System (BISS) interface components. An advanced development (AD) program will be initiated for the FIDS radio frequency (RF) data communication capabilities, response/deterrent capability, covertly-operated duress sensor, contraband sensor, cargo security protection and highly secure locks and containers. In addition, an advanced development effort will be continued in the area of lighting and barrier systems. The purpose of this effort is to identify items which can meet military physical security requirements in the near range timeframe and to identify improved lighting and barrier concepts which require additional development before they can be implemented.

3. FY 1980 Planned Program: Lighting and Barriers: Development initiated in FY78 will continue with a Validation In-Process Review being conducted on the first group of lighting and barrier components. Development of additional components will be initiated as appropriate. Prototype lighting and barrier systems will be designed, procured, and initially evaluated for effectiveness and safety. FIDS: The AD breadboard models of the items procured in FY79 will be evaluated in-house. Contracts will be awarded to correct deficiencies found during the evaluation of the breadboard models and to deliver brassboard models which will be evaluated in-house. The results of these evaluations will be used to prepare documentation for a Validation In-Process Review which will be held in FY81.

4. FY 1981 Planned Program: Lighting and Barriers: The prototype systems procured during FY80 will continue to be evaluated with particular emphasis on physiological and psychological factors affecting both the observers and intruders. AD models with shortcomings corrected and improvements incorporated will be procured. Concept formulation documentation will be prepared. FIDS: The evaluation of the brassboard items which was initiated in FY80 will be complete and a Validation In-Process Review will be conducted to demonstrate the suitability of these items for entry into full-scale development. Contracts will be awarded for experimental models of a miniaturized Low Light Level TV surveillance device, adaptive/discriminative sensors, and intrinsically secure data links.

5. Program to Completion: This is a continuing program. In FY82 and the outyears, there will be a continuing effort to develop physical security hardware which is capable of countering the ever-increasing sophistication of the threat to military personnel and property. Coordinated efforts with the other Services will be directed towards integrating components/subsystems/systems developed under this Program Element into a completely integrated interior/exterior physical security system for Department of Defense.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.06.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	365	3463	4050	5700	Continuing	Not Applicable
D243	IFF Developments	365	1463	350	350	Continuing	Not Applicable
D297	IFF NATO	0	2000	3700	5350	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: (1) The bulk of this effort is directed toward developing a battlefield identification system (tank-by-tank, tank-by-aircraft, etc.) in coordination with NATO nations as part of the NATO Identification System (NIS). The need for such a system is created by the numerical superiority of Warsaw Pact armor, requiring US and NATO forces to take maximum advantage of improved weapon effectiveness at extended ranges. (2) Additional IFF developments include improving the current Mark XII air defense system as part of a tri-Service program; and (3) providing major Army air defense systems (HAWK, PATRIOT) with a noncooperative means of identifying aircraft.

C. BASIS FOR FY 1980 RDTE REQUEST: The Battlefield Identification Friend-or-Foe (BIFF) program is pointed toward meeting two major milestones established in concert with NATO nations: (1) agreement on the optimum method for BIFF interrogation (laser or microwave) by Dec 79 and (2) agreement on the total BIFF signal architecture through a NATO Standardization Agreement (STANAG) in early 1982. Efforts will be initiated in FY79 to (1) determine the optimum design of a BIFF system, (2) construct and test demonstration models of the optimum design, and (3) obtain NATO agreement on the system. Contracts for System Engineering and Hardware Construction/ Integration will be awarded in FY79, with the major portion of the efforts to be accomplished in FY80 and FY81. In the area of Mark XII improvements, an FY80 contract award is planned to design, fabricate, and test circuit improvements for interrogators AN/PPX-3 (STINGER) and MSR-400/5 (US ROLAND) to remedy weaknesses uncovered in the FY79 measurements program. The design and computer simulation effort on a noncooperative identification system for Improved HAWK will be completed in FY79, enabling a contract for an advanced development model of the system to be awarded in FY80.

Program Element: #6.37.06.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	544	3463	3685		

FY78 development costs were less than estimated. Starting in FY80 NATO tasks have been consolidated into D297. D243 will consist of Mark XII improvements and noncooperative efforts.

E. OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.37.06.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION:

1. Battlefield Identification Friend-or-Foe (BIFF): Projections of future conflicts in Central Europe depict a Warsaw Pact assault involving numerically superior armor. It is forecast that battle lines will not be well defined and that friendly and enemy ground vehicles will be intermingled. The battle will be characterized by equipment (weapons and electronics) that is technologically advanced, so that devastating firepower can be delivered at extended ranges. In this scenario, traditional methods of identification will be inadequate. The effectiveness of command and control links (if not jammed) will be severely reduced by the intermingling of friendly and enemy forces, and visual observation will not provide capabilities consistent with the ranges of modern target acquisition and weapon systems. For these and other reasons, the US has been a participant in a NATO Working Group to define the signal architecture for a NATO Identification System (NIS), of which the BIFF is an integral part. The various systems proposed by the nations have been examined and discussed within the NATO arena, and a draft NATO Standardization Agreement (STANAG) has been produced. The draft STANAG is general in nature, reflecting the disagreements among the nations over the optimum system design. A two to three year period is scheduled by NATO to refine the document and obtain agreement among the nations on the detailed system. This program is directed toward conducting the necessary design and hardware efforts to insure that the final STANAG reflects the most cost-effective system.

2. Mark XII Improvements: The US has a significant investment in the current air defense identification system, the Mark XII. A tri-Service Technical Improvement Program with Air Force lead has been initiated to improve the Mark XII system so that its useful life can be extended to the time when the air defense portion of NIS is ready for implementation.

3. Noncooperative Identification: Aircraft that do not respond to Mark XII interrogation could be enemies, neutrals, or friends with inoperative transponders. A program has been initiated to develop a noncooperative identifier that will positively identify both friendly and hostile aircraft, to improve weapon effectiveness, and safeguard friends. The system makes use of techniques developed by the Navy and Air Force which are optimized for use with Army air defense weapons.

G. RELATED ACTIVITIES: Memoranda of Understanding are being negotiated by the Office of the Director of Defense Research and Engineering with the United Kingdom and the Federal Republic of Germany for data and technology exchanges in support of the development of the NATO Identification System.

H. WORK PERFORMED BY: The BIFF program is managed by the US Army Combat Surveillance and Target Acquisition Laboratory at Fort Monmouth, NJ. The systems engineering effort is anticipated to be performed by the M.I.T. Lincoln Laboratory in Lexington, MA. Contractors that are expected to bid for development of the hardware include Hughes Aircraft Corporation, Fullerton, CA; ITT, Nutley, NJ; RCA Corporation, Camden, NJ; Hazeltine Corporation, Greenlawn, NY; and Texas Instruments, Dallas, TX. Work on Mark XII improvements has been accomplished by Hazeltine Corporation, and additional work may be performed by Hazeltine and by Teledyne Electronics, Newbury Park, CA. The noncooperative identification work for HAWK is being performed by SCOPE Electronics, Incorporated, Reston, VA.

Program Element: #6.37.06.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Completed in-house fabrication and testing of two Battlefield Identification Friend-or-Foe (BIFF) systems employing laser and microwave interrogation. Acted as lead Service for architecture definition of the NATO Identification System (NIS). Awarded and monitored tri-Service funded NIS architecture study contract resulting in US input to NATO working group. Participated in the preparation of a NATO draft NATO Standardization Agreement (STANAG) for NIS, completed in September 1978. Completed Mark XII electronic countermeasure (ECM) vulnerability measurements on interrogators AN/TPX-46 (HAWK, PATRIOT) and AN/TPX-50 (FAAR) as part of tri-Service Mark XII Technical Improvement Program (TIP). Awarded contract for design effort/computer simulation of a noncooperative aircraft identification system for Improved HAWK.

2. FY 1979 Program: BIFF (IFF NATO): Award a Systems Engineering Contract to M.I.T. Lincoln Laboratory to perform the necessary computer simulations and tradeoff analyses to determine the most cost-effective design of a BIFF system. Award a competitive Hardware contract for design efforts to integrate the BIFF system into the major weapon platforms, and fabrication efforts to construct demonstration models representative of the design generated by the Systems Engineering contractor. Participate in exchange of technical information on IFF through NATO and through Memorandum of Understanding (MOU) with United Kingdom and Federal Republic of Germany. Mark XII Improvements: Award contract to conduct vulnerability measurements on Army interrogators AN/PPX-3 (STINGER) and MSR-400/5 (US ROLAND). Award contract to design, fabricate, and test circuit improvements for AN/TPX-46 (HAWK, PATRIOT) and AN/TPX-50 (FAAR) to remedy weaknesses uncovered in measurements program. Noncooperative IFF: Complete design effort/computer simulation of noncooperative aircraft identification system for Improved HAWK. Demonstrate simulated performance using tapes from HAWK radar. Obtain Letter of Agreement from user.

3. FY 1980 Planned Program: Battlefield Identification Friend-or-Foe (BIFF) (NATO IFF): Continue Systems Engineering effort with Lincoln Laboratory begun in FY79. Hardware contractor will complete weapon integration engineering effort and begin construction of demonstration models. Decision will be made, in concert with NATO nations, on optimum method for BIFF interrogation (laser or microwave). Participate in NATO working groups on NATO Identification System (NIS). Exchange technical information on NIS with NATO nations and with Federal Republic of Germany and United Kingdom through Memoranda of Understanding. Mark XII Improvements: Award contract to design, fabricate, and test circuit improvements for interrogators AN/PPX-3 and MSR-400/5 based on results of measurements program. Pursue product improvement proposals for improvements to AN/TPX-46 and AN/TPX-50.

4. FY 1981 Planned Program: BIFF (NATO IFF): Continue BIFF Systems Engineering effort with recommendation from Lincoln Laboratory on detailed design of most cost-effective BIFF. Complete hardware/integration contract. Conduct operational tests with user, and demonstrate equipment to NATO nations. Obtain models of Federal Republic of Germany CAPRIS system for engineering and operational tests . Participate in Nato working groups to obtain agreement on BIFF system design. Mark XII Improvements: Complete development and test of improvements on STINGER and ROLAND interrogators. Pursue product improvement proposal.

5. Program to Completion: This is a continuing program. An agreed upon NATO Standardization Agreement (STANAG) for the NIS is planned for FY82. Development of noncooperative identification systems for airborne and ground targets will continue.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.07.A
Title: Communications Development
DoD Mission Area: #443 - Tactical Communications
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1672	6381	6700	6500	Continuing	Not Applicable
	QUANTITIES						*
D137	Joint Tactical Information Distribution System (JTIDS) Development	800	3700	3700	3000	0	12262
D246	Tactical Communications Development	0	442	1500	2000	Continuing	Not Applicable
D437	Tactical Radio Communications System (TRCS)	872	2239	1500	1500	Continuing	Not Applicable

*Quantity of diversified items.

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the advanced development of tactical communications equipment and systems that are not included in the Joint Tactical Communications (TRI-TAC), the Tactical Satellite Communications Ground Environment (TACSATCOM) and the Single Channel Ground and Airborne Radio System (SINCGARS-V) programs. This program is needed to provide tactical commanders with communications equipments and systems to ensure effective command and control of tactical forces on the modern, highly mobile battlefield. Emphasis in this program is on applying technological advances that offer significant improvements in the areas of reliability, reduction of power consumption and weight, reduction in vulnerability to electronic countermeasures and nuclear effects, system response, mobility, set up/displacement times, spectrum utilization, message/data handling times and reduced life cycle costs.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue Army participation in the Joint Tactical Information Distribution System (JTIDS) development through the incorporation of Army technical requirements into the JTIDS family of equipment which includes cost reduction efforts to achieve a more affordable terminal for size and weight constrained applications. Efforts in project D437 will be primarily related to improvements in ancillary equipments (i.e., antennas and quick erection mast) applicable to both current and future generation tactical net radios. Efforts in project D246 will involve the field test of a light-

weight fiber optic local distribution cable system with the AN/TYC-39 Message Switch and preparation for transition of this effort to engineering development in FY 1981. Advanced development efforts for a highly mobile, air-layable/expendable fiber optic cable and a Mobile Intercept-Resistant (MISR) millimeter wave radio will be initiated.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission (for projects D137, D246, and D437 only)	872	6381	9304	Continuing	Not Applicable

The increase in FY78 funding in the FY 1980 request is a result of a FY 1978 Congressionally approved reprogramming action for project D137 (Joint Tactical Information Distribution System Development). Decrease in FY 1980 funding results from the transfer of the development of Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V) program ancillary equipments (vehicular intercom system and low noise audio transducers) to Program Element 6.37.46.A (SINCGARS-V) from project D437 starting in FY80. Decrease in project D246 funding is due to the transition of the Long Haul Fiber Optic Cable System from advanced development to engineering development in late FY 1979 ahead of the schedule estimated in the FY 1979 budget submission. Project D245 (Strategic Communications Development) carried in this program element on the FY 1979 submission has been transferred to Program Element 3.31.26.A (Long Haul Communications) and combined with project D149. This restructure was accomplished to correct a minor inconsistency wherein project D245, as a strategic communications program, was being carried in Budget Activity 4 (Tactical Program) versus Budget Activity 5 (Communications and Intelligence). The FY 1979 submission funding profile shown above does not include project D245 which has been reflected in the funding profile for Program Element 3.31.26.A.

E. OTHER APPROPRIATION FUNDS: ($ in thousands): Not applicable.

Program Element: #6.37.07.A
Title: Communications Development
DoD Mission Area: #443 - Tactical Communications
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION This program provides the advanced development for tactical communications equipment and systems other than those developed under the Joint Tactical Communications (TRI-TAC), the Tactical Satellite Communications Ground Environment (TACSATCOM) and the Single Channel Ground and Airborne Radio Subsystems (SINCGARS-V) programs. Efforts are accomplished in three projects as shown in paragraph A above. The Joint Tactical Information Distribution System (JTIDS) is a joint service program to develop and acquire an integrated tactical data communications, navigation and identification system which is secure and jam resistant. The Army's program is structured to capitalize on previous Air Force/Navy JTIDS development to reduce development time. It provides for improving the Army's information distribution and position location capability required by real time command and control and weapons systems. Project D246 is concerned with advanced developments employing new technology to provide significant improvements in the areas of Terminal Equipment (Information Entry/Exit Devices) such as a Tactical Document Copier to reduce manpower and lost time in the reproduction of record traffic (messages) in the tactical environment; Trunk and Loop Transmission (multichannel) Devices such as fiber optic cables and intercept resistant millimeter wave radios to improve mobility, reduce size/weight/power consumption, increase reliability, improve system vulnerability to countermeasures and electromagnetic pulse, and provide a signal hiding capability; and Tactical Antenna Systems to overcome the existing limitations such as low physical survivability, high visibility, excessive installation/displacement time, vulnerability to countermeasures and direction finding, and poor efficiency due to mechanical or electromechanical tuning mechanisms. Project D437 is concerned primarily with the advanced development of tactical net radios (single channel radio) equipments and ancillary devices such as a survivable Low Profile Antenna for armored vehicles, a Log Periodic Antenna to provide range extension and improved countermeasures resistance for netted radios, a Broadband Antenna to improve coupling efficiency with minimum tuning for manpack and vehicular radios used in a frequency hopping mode, and a Quick Erection Mast to improve installation/displacement of command posts. Project D437 efforts are in support of and are complementary to the Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V) program.

G. RELATED ACTIVITIES: Exploratory developments for this program are conducted in Program Element 6.27.01.A (Communications-Electronics). Projects proceeding into engineering development are funded in Program Element 6.47.01.A (Communications Engineering Development). These efforts are closely coordinated by the Army with developments in Program Elements 2.80.10.A (Joint Tactical Communications Program) and 6.37.45.A (SINCGARS-V) to insure all programs are complementary and to avoid any duplication of efforts.

H. WORK PERFORMED BY: In-house developing agencies are the US Army Communications Research and Development Command (CORADCOM), Project Manager for Army Tactical Communications Systems (ATACS) and Project Manager for Single Channel Ground and Airborne Radio Subsystem (SINCGARS), all located at Fort Monmouth, NJ. Contractual efforts include Microwave Power Devices Incorporated, Plainview, Long Island, NY; Hughes Aircraft Company, Fullerton, CA; IBM Corporation, Owego, NY; ITT Corporation, Nutley, NJ; and Singer Kearfott Co, Little Falls, NJ. Competitive contract awards for local distribution fiber optic cable system, expendable fiber optic cable system, net radio power amplifier and broadband vehicular antennas advanced developments are planned for FY 1980.

Program Element: #6.37.07.A
DoD Mission Area: #443 - Tactical Communications

Title: Communications Development
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Participated in studies related to Army application of Joint Tactical Information Distribution System (JTIDS). Awarded concept development contracts for the Class 3 Joint Tactical Information Distribution System (JTIDS) terminal for manpack and missile applications in 1977. Advanced Development models of the Tactical Automatic Message Entry Device were successfully tested in an European Field exercise and demonstrated that the device can replace nine teletypewriters and operators, and reduce message processing time by 70 percent. A Letter of Agreement (LOA) for Optical Cable Transmission Systems was approved by the combat developer in June 1977. Field tests for a 38 gagahertz millimeter wave radio were initiated. Advanced development efforts on the Low Profile Vehicular Antenna and a Capacitive Tuning Element were continued. Awarded advanced development contract in September 1978 for High Power Amplifier design and model. Completed analyses pertaining to Army application of JTIDS and completed concept definition contracts for the JTIDS Class 3 low cost terminal for size and weight constrained applications.

2. FY 1979 Program: JTIDS efforts will involve conducting ground propogation testing; participation in joint net management studies; interoperability testing with the AN/TSQ-73 missile minder for air defense; definition of interfaces with other weapons systems such as Tactical Fire Direction (TACFIRE) and Position Location and Reporting System (PLRS); pursuing cost reduction approaches in terminal development. Project D437 efforts will involve continuing support on the High Power Amplifier and broadband antenna programs; and awarding advanced development contracts for the Quick Erection Mast and the Survivable Low Profile Antenna for armored vehicles. Project D246 efforts will involve advanced development efforts and contract award for a fiber optic local distribution cable system, and the initiation of a Letter of Agreement for the Mobile Intercept Resistant (MISR) millimeter wave radio.

3. FY 1980 Planned Program: Project D137 will include completion of the AN/TSQ-73 interoperability testing. Successful completion will lead to a production decision for an Adaptable Surface Interface Terminal (ASIT). Award contract for a JTIDS net management study to provide the baseline for management techniques to be incorporated in JTIDS terminal software. Continue to participate in Class 2 terminal development efforts that will lead to definition and design parameters for a Class 3 terminal suitable for Army ground environment. Continue interface design and terminal cost reduction efforts in preparation for FY 1981 testing. In Project D246, continue advanced development of fiber optic local distribution cable systems and conduct a Development and Operational Test (DT/OT I) using the AN/TYC-39 Message Switch. Continue advanced development efforts on the Mobile Intercept Resistant (MISR) Radio and air layable/expendable fiber optic cable. In Project D437, award contracts for High Power Amplifier DT/OT-1 test models and for a Broadband Vehicular Antenna. Continue advanced development efforts in support of Quick Erection Mast and Survivable Low Profile Antenna programs.

Program Element: #6.37.07.A
DoD Mission Area: #443 - Tactical Communications

Title: Communications Development
Budget Activity: #4 - Tactical Programs

4. FY 1981 Planned Program: Conduct testing to validate Joint Tactical Information Distribution System (JTIDS) with Army data systems such as Tactical Fire Direction System (TACFIRE), Tactical Operation System (TOS) and Position Location and Reporting System (PLRS) to establish a baseline for proceeding into full scale development. Complete advanced development efforts on the Quick Erection Mast; and continue support on the Local Distribution Fiber Optic Cable System and the air layable/ expendable fiber optic cable program. Initiate advance development for the Mobile Intercept Resistant (MISR) millimeter wave radio. Conduct Development and Operational Tests (DT/OT-I) on the local distribution fiber optic cable system.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.11.A
DoD Mission Area: #445 - Electronic Warfare/Counter C^3

Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2256	3793	6995	7249	Continuing	Not Applicable
DB52	Scout/Attack Helicopter Survivability Equipment	1163	2100	2670	5533	Continuing	Not Applicable
D653	Special Electronic Mission Aircraft (SEMA) Survivability Equipment	1093	1693	4325	1716	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element (PE) develops the technology and supports the system engineering/effectiveness efforts which will provide US and allied aircraft with the needed protection against enemy infrared, optical, laser and/or radar-directed threats. The program is the continuation of a deliberate, proven approach to achieve the survivability urgently required to accomplish the Army attack, assault, and special electronic mission aircraft (SEMA) mission requirements. The program is structured to preclude service duplication and reflects the Army's responsibility to implement Tri-Service Memorandum of Agreement reached in 1977. (See Paragraph G, Related Activities). This program responds to the Required Operational Capability (ROC) for Aircraft Survivability Equipment (ASE). ASE is needed for both current and developmental Army aircraft in order to accomplish combat missions.

C. BASIS FOR FY 1980 RDTE REQUEST: The principal component efforts address two of the most serious threats to Army aircraft. These are the continued development of an optical countermeasures system for attack and scout aircraft, and an advanced surface-to-air missile (SAM) jammer for special electronic mission aircraft (SEMA). A millimeter wave radar warning receiver subsystem will be developed to adapt to the basic radar warning receiver. Additionally, a millimeter wave chaff cartridge load will be designed for the M130 dispenser. Vulnerability reduction efforts will develop a ballistically tolerant fuel cell for AH-1 attack aircraft. Threat exploitation and infrared (IR) measurements will continue as required to support ongoing passive and active IR countermeasures.

Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DoD Mission Area: #445 - Electronic Warfare/Counter C3 Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE (Funds as shown in FY 1979 submission)	2406	3793	11693	Continuing	Not Applicable

Reduction in the FY 1980 submission reflects a refinement in tasks and a reprioritization of projects within this Program Element to concentrate on an optical warning and location/detection system for attack helicopters and to accelerate Advanced Development (AD) of an advanced surface-to-air missile (SAM) jammer for special electronic mission aircraft (SEMA) aircraft. Earlier planned radar and infrared signature reduction measurements and modeling efforts have been deleted and/or reduced in scope in FY80 as have vulnerability reduction efforts in flight controls and fly-by-wire concepts.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.11.A
DoD Mission Area: #445 - Electronic Warfare/Counter C3

Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This Program Element (PE) combines two Advanced Development (AD) projects managed by the Army Project Manager for Aircraft Survivability Equipment (PM-ASE) in FY 1979: PE #6.37.11.A/DB52, Scout/Attack Helicopter Survivability Equipment; and PE #6.37.11.A/D653, Special Electronic Mission Aircraft (SEMA) Survivability Equipment. Both projects were initiated after the Soviets introduced the SA-7 shoulder fired surface-to-air missile (SAM) in the Mideast. The objectives of DB52 ASE concentrated on systems engineering, signature reduction, infrared (IR) suppression, effectiveness measurements and evaluations, and ballistic hardening, or vulnerability reduction. Project D653, Special Electronic Mission Aircraft Survivability Equipment developed warning devices and active IR, optical and radar countermeasures. In 1972 the SA-7 was used against Army helicopters in Vietnam which were quickly equipped (within 4 months) with IR suppressors and low reflectance paint developed under DB52 Scout/Attack Helicopter Survivability Equipment. The success of the suppressors provided credible evidence of tactical helicopters operating against surface-to-air missiles. This success coupled with demonstrations of the ability to jam almost any known IR threat missiles (IR jammer) and to detect any known tactical air defense radar (radar warning receiver) formed the basis for expanding the ASE program in all technological areas as well as balancing the funding in advanced development, engineering development and production. The objectives are retained in the combined PE and address the technology to counter all radar, infrared and optical/laser-directed threat weapon systems. The resultant program established in 1974-75 is on schedule.

G. RELATED ACTIVITIES: This program is conducted in conjunction with PE 6.47.11.A, Aircraft Electronic Warfare (EW) Self-Protection System, also managed by PM-ASE, and PE 6.32.15.A, Joint Survivability Investigations, of which PM-ASE is the Senior Army Representative. In 1977, the Services signed a Memorandum of Agreement outlining the following responsibilities for Tri-Service development and production of the following aircraft EW self-protection (AEWSP) systems for helicopters and selected fixed-wing aircraft: (1) Army: Radar warning receivers, radar jammers, infrared (IR) jammers for small helicopters, pulse doppler missile warning detectors and laser warning receivers; (2) Navy: IR jammers for large helicopters, continuous wave (CW) radar jammers and ultraviolet (UV) missile warning detectors; and (3) Air Force: IR missile warning detectors for fixed-wing and selected large helicopters. International coordination is achieved through North Atlantic Treaty Organization (NATO), NATO Army Armaments Group (NAAG), and Quadripartite Working Groups.

H. WORK PERFORMED BY: US Army Aviation Research and Development Command (AVRADCOM), St. Louis, MO; US Army Electronics Research and Development Command (ERADCOM), Electronic Warfare Laboratory (EWL), Ft. Monmouth, NJ; US Army Armament Research and Development Command (ARRADCOM), Dover, NJ. Contractors: Sanders Associates, Inc., Nashua, NH; ITT Corporation, Nutley, NJ; TRACOR, Inc., Austin, TX; Hughes Helicopter, Culver City, CA; Calspan Corporation, Buffalo, NY, Perkin Elmer, Norwalk, CT; Applied Technology, Inc., Mountain View, CA; Tasker Systems, CA, Martin-Marietta, Orlando, FL, Hughes Aircraft, Culver City, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.37.11.A
DoD Mission Area: #445 - Electronic Warfare/Counter (C3)

Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
Budget Activity: #4 - Tactical Programs

1. FY 1978 and Prior Accomplishments: In 1976, improved versions of the IR suppressors, used to defeat the SA-7 missile in the Republic of Vietnam, were fielded to front line US tactical aircraft in Germany, Korea, and the United States. Advanced Development (AD) was completed and engineering development (ED) was initiated for IR suppressors for growth threats on the following aircraft: OH-58 (FY 1975), OV-1 MOHAWK (FY 1975), AH-1 COBRA (FY 1977), RU-21 GUARDRAIL (FY 1977). Infrared jammers applicable to attack, observation, and utility helicopters including AH-64 and UH-60 BLACK HAWK completed AD in FY 1976. A pulse doppler missile detector completed Advanced Development (AD) in FY 1977. An advanced radar warning receiver, AN/APR-39(V)2, for special electronic mission aircraft (SEMA), completed AD in FY 1976 as did a dual purpose chaff and flare dispenser and tactical aircraft radar jammer. An optically designed flat plate canopy, which reduced sun glint, entered Engineering Development (ED) in 1975 for the AH-1 and OH-58 aircraft. An improved light shade of infrared (IR) paint modeled after an Air Force development, began ED in 1977 for SEMA. AD of the optical warning, location and detection (OWL/D) system started in 1976. AD was completed in FY 1978 for a laser warning receiver for attack and scout aircraft and a continuous wave radar jammer for SEMA aircraft. In summary, Aircraft Survivability Equipment (ASE) for each technological area has proceeded through AD as scheduled through FY 1978.

2. FY 1979 Program: The advanced development of a new radar jammer which addresses the threat to SEMA aircraft from sophisticated ground launched missiles has been initiated in FY 1979. Critical state-of-the-art components comprising the heart of the jammer have been purchased and jamming techniques and wave forms will be investigated and tested. The primary threat to be addressed is the Soviet SA-4 class of weapons. Plans are to coordinate with the USN/USAF advanced self-protection jammer (ASPJ) engineering development program to examine ASPJ technology applicable to SEMA. While the size, complexity, and cost of the ASPJ is not compatible with Army aircraft, some of the threats are common hence ASPJ jamming methodologies and techniques should have application to the Army advanced surface-to-air missiles (SAM) jammer concept. A derivative of the ASPJ, scaled down for Army use will be contracted for in FY 1979. Tactical warning location and detection (OWL/D) system tests will continue through FY 1979 emphasizing essential system characteristics required for an optical countermeasure system to begin development in FY 1980. Development of countermeasures against millimeter wave radars will be initiated in FY 1979 with development of a millimeter wave chaff cartridge for the M130 flare/chaff dispenser system and development of a millimeter wave capability for the AN/APR-39 radar warning receiver (RWR). Advanced development and test is planned for a high survivability, run dry transmission for the AH-1S. Development of ballistic protection for AH-1S fuel cells will be initiated in FY 1979. In addition, IR and radar measurements and field tests for ongoing suppressor and jammer developments will continue.

3. FY 1980 Planned Program: Advanced development of an optical countermeasure system for scout and attack helicopters will begin based upon the OWL/D test results and FY 1978-79 jamming studies. This system will address the optical fire control mode found on all Soviet air defense weapons, i.e., visual optics, TV cameras and night vision defices. The AD of millimeter wave chaff cartridge for the M130 flare/chaff dispenser and the development adaptation of a millimeter wave capability for the AN/APR-39(V)1 RWR will be completed and development testing/operational test (DT/OT) I conducted in FY80. Development of the advanced SAM jammer

system began in FY 1979 with one of the USN/USAF ASPJ participants will continue. Development and test of ballistically protected AH-1S fuel cells will continue. Exploitation of threat systems and development and test of countermeasure techniques will continue.

4. FY 1981 Planned Program: The optical countermeasure system development will be completed and installed on an attack helicopter for DT/OT in preparation for a FY82 Engineering Development (ED) program. The development of cost and penalty effective vulnerability reduction features for the AH-1S will continue based upon results of a FY 1979 study now in progress. Development and operational testing of the advanced SAM jammer for SEMA aircraft will be completed leading to an ED award this fiscal year. Development of laser countermeasure equipment will be initiated to address the laser beam rider and laser designated missile threats to Army aviation. Final configuration changes and tests will be made on the millimeter wave RWR modifications to the AN/APR-39(V)1 and the millimeter wave chaff cartridge for the M-130 chaff/flare system prior to the conduct of an engineering development qualification in FY 1982.

5. Program to Completion: This is a continuing program. The aircraft survivability equipment and electronic warfare self-protection countermeasure advanced development programs respond to stated user requirements and threat documentation. The requirements and threats are reviewed on a continuing basis by the Aircraft Survivability Equipment (ASE) Permanent Steering Group (PSG) with broad representation from the US Army Training and Doctrine Command (TRADOC) and US Army Materiel Development and Readiness Command (DARCOM). Inter-service review is accomplished in accordance with the Tri-Service Memorandum of Agreement by the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS).

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.12.A
Title: Mapping and Geodesy
DoD Mission Area: #446 - Navigation, Positioning, and Related Systems
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	143	2782	930	1877	Continuing	Not Applicable
	QUANTITIES						
	Prototype Analytical Photogrammetric Positioning						1
	Prototype Quick Reaction Multicolor Printer						1
	Prototype Forward Area Survey Equipment						1
D580	Field Army Mapping	26	798	900	650	Continuing	Not Applicable
D673	Field Army Surveying	117	1774	30	1227	Continuing	Not Applicable
D862	Terrain Data Developments	0	210	0	0	Continuing	Not Applicable
DT44	Army Terrain Information System (ARTINS)	0	0	0	0	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objectives of this advanced development program are to develop techniques, software, and equipment for Army mapping, surveying, and Military Geographic Intelligence activities in direct support of Field Army tactical deployment of forecast and weapon system operation. Major elements of the program are the development of an Analytical Photogrammetric Positioning System, an Integrated Survey Instrument, a Forward Observer Direction Finder, Forward Area Survey Equipment, and advanced components to upgrade the Topographic Support System. This program addresses the development of equipment to generate and disseminate up-to-date general and specific purpose maps of tactical areas which will enable commanders to use the terrain to their advantage against numerically superior forces; and to provide coordinate elevations and azimuth quickly and accurately enough to allow artillery fire to be delivered for maximum effect.

C. BASIS FOR FY 1980 RDTE REQUEST: Complete fabrication and testing of the experimental Advanced Analytical Photogrammetric Positioning System. Begin development of and award contracts for development of experimental prototypes of a Quick Response Multicolor Printer and Forward Area Survey Equipment.

Program Element: #6.37.12.A
Title: Mapping and Geodesy
DoD Mission Area: #446 - Navigation, Positioning, and Related Systems
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Complete Development Test II/Operational Test II (DT II/OT II) of Advanced Analytical Photogrammetric Positioning System (AAPPS)	2Q FY 1980	Not Shown
Complete DT I/OT I of Forward Area Survey Equipment (FASE)	2Q FY 1982	Not Shown
Complete DT I/OT I of Quick Reaction Multicolor Printer (QRMP)	3Q FY 1982	Not Shown

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	143	4282	4631	Continuing	Not Applicable

A Congressional decision to defer development of the Army Terrain Information System and delay in firming requirements for some planned developments have combined to reduce FY 1979 and FY 1980 requirements.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.12.A
Title: Mapping and Geodesy
DoD Mission Area: #446 - Navigation, Positioning, and Related Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objectives of this program are the development of technqiues, materiel, and equipment to support rapid acquisition, processing, and dissemination of position location, mapping, and other terrain data. These objectives are in direct support of the tactical deployment of forces and the operations of weapons systems. This program element includes work on the following systems: (1) development of a prototype Advanced Analytical Photogrammetric Positioning System (AAPPS) which will cost effectively provide position coordinates of friendly and target locations; (2) development of a Quick Response Multicolor Printer which will permit rapid reproduction of relatively small quantities of topographic products; (3) development of a Factor Map Synthesizer which will speed up and simplify map revisions in the field; (4) development of an Integrated Survey Instrument which will permit Field Artillery Units to conduct local area surveys with less equipment and fewer personnel; (5) development of a Miniaturized Gyrocompass which will permit forward observers to obtain more accurate azimuths and thereby locate targets more accurately; and (6) development of low cost vehicle mounted Forward Area Survey Equipment for meeting minimum accuracy requirements for weapon systems positioning.

G. RELATED ACTIVITIES: The Army works directly with Air Force, Navy, and Marine Corps, and under the coordination of Defense Mapping Agency (DMA) and the Director of Defense Research and Engineering in the functional area of Mapping and Geodesy. Specific related program elements are as follows: DMA Program Element 6.37.01.B, Mapping, Charting, and Geodesy Investigations and Prototype Development; DMA Program Element 6.47.01.A, Mapping, Charting, and Geodesy Engineering Development and Test; Army Program Element 6.27.07.A, Mapping and Geodesy; and Army Program Element 6.47.16.A, Mapping and Geodesy.

H. WORK PERFORMED BY: This program is the responsibility of the US Army Engineer Topographic Laboratories (USAETL) at Fort Belvoir, VA. The remainder is performed by contractors. The major contractors are: Litton Systems, Incorporated, Woodland Hills, CA; IDEAS, Incorporated, Beltsville, MD; Bausch and Lomb, Rochester, NY; DMA Incorporated, Melbourne, FL; and Xerox Corporation, Pasadena, CA. All contracts exceed $25,000.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Initiated development of prototype special map products in 1970. Design and development of a prototype Position and Azimuth Determining System (PADS) was initiated in 1971. Prototype special map products to support battlefield sensor, infantry, and airmobile operations were completed in FY 1972. In 1974 completed the test, evaluation, and trade-off analysis of the jeep-mounted PADS. Initiated contractual studies and experimentation on the problems of operating a PADS in a helciopter. In 1975, completed studies on helicopter operation of the Position and Azimuth Determining System. Initiated advanced development of an Advanced Analytical Photogrammetric Positioning System. In FY 1976, completed component studies for development of a Forward Observer Vehicle Kit and assembled an in-house correlation facility to support development of a target reference scene generation capability for the PERSHING II missile. Hardware to demonstrate the Army Terrain Information System concept was procured. In FY 1977, completed development and testing of a prototype Built-Up Area map product and began contractual development of the Advanced Analytical Photogrammetric Positioning System.

Program Element: #6.37.12.A
DoD Mission Area: #446 - Navigation, Positioning, and Related Systems

Title: Mapping and Geodesy
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Complete contractual development of the Advanced Analytical Photogrammetric Positioning System. Conduct Development Test I (DT I) of the system during the third and fourth quarters. Demonstrate a system for Tactical Exploitation of Digital Elevation Data.

3. FY 1980 Planned Program: Secure approval of a Required Operational Capability (ROC) to support engineering development of the Advanced Analytical Photogrammetric Positioning System in the fourth quarter and move the program to that phase. Begin development of an experimental Quick Response Multicolor Copier. Award a contract for its design and fabrication in the third quarter.

4. FY 1981 Planned Program: Continue contractual development of the Quick Response Multicolor Copier. Begin development of Forward Area Survey Equipment. Award a contract for design and fabrication of an experimental model in the third quarter.

5. Program to Completion: This is a continuing program. Advanced development of the Quick Response Multicolor Printer and the Forward Area Survey Equipment will be completed in FY 1983. A Factor Map Synthesizer, an Advanced Map Update, a Miniaturized Gyrocompass, an Integrated Survey Instrument, and a Near Real Time Positioning Capability will be developed between FY 1982 and FY 1984. Other items are scheduled for development in later years.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.19.A
Title: Special Purpose Detectors
DoD Mission Area: #411 - Battlefield Surveillance
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	900	3000	5000	Continuing	Not Applicable
	QUANTITIES						Not Applicable
DK72	Radars	0	900	3000	5000	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Battlefield Surveillance and Target Acquisition Radar (BSTAR) will be a lightweight, highly mobile, all-weather ground surveillance radar capable of providing surveillance and target acquisition data on hostile targets BSTAR will detect and locate targets with sufficient accuracy and timeliness to provide effective counterfire and intelligence data to support division operations. US forces are unable to match the numerical superiority of Soviet/Warsaw Pact forces. BSTAR will provide timely and accurate data on the position of hostile forces, allowing the commander to utilize available resources to offset this numerical superiority. BSTAR will replace the AN/TPS-25, AN/TPS-58, and some AN/PPS-5 radars.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue development of prototype BSTAR radars to achieve fielding in 1986. Prepare for Development Test/Operational Test (DT/OT) I.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Contract Award	4QFY 1979	4QFY 1979
DT/OT I	2QFY 1983	
Validation In-Process Review	3QFY 1983	

Program Element: #6.37.19.A
DoD Mission Area: #411 - Battlefield Surveillance

Title: Special Purpose Detectors
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	0	900	3900	Continuing	Not Applicable

FY 1980 funding has been decreased because of the necessity to fund other high priority programs.

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.37.19.A Title: Special Purpose Detectors
DoD Mission Area: #411 - Battlefield Surveillance Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Battlefield Surveillance and Target Acquisition Radar (BSTAR) is being developed to detect and locate hostile targets with sufficient accuracy and timeliness to provide effective artillery counterfire and fire adjustment, and to support intelligence operations within the division. The BSTAR program is designed to eliminate a lengthy and expensive engineering development. Following a competitive bidding, a contract will be awarded to procure advanced development radars which will undergo Development Test/Operational Test (DT/OT) I. These systems will then be modified and refurbished prior to DT/OT II. This modification and refurbishment will shorten the development cycle by approximately two years and eliminate the need to procure engineering development systems.

G. RELATED SYSTEMS: Technology base radar efforts are conducted under Program Element 6.27.03.A, Combat Surveillance, Target Acquisition, and Identification. Program Element 6.27.26.A, Army Support of DARPA, is a technology base program to investigate the netting of radars to provide the field commander overall improved target data. BSTAR will incorporate emerging technology and be compatible with radar netting techniques demonstrated under Program Element 6.27.26.A.

H. WORK PERFORMED BY: US Army Electronics Research and Development Command, Ft Monmouth, NJ.

PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not applicable.

2. FY 1979 Program: Initiate BSTAR program. Conduct analyses to determine the feasibility of achieving] detection ranges on ground moving targets with a ground based radar in terrain typical of central Europe; improvements derived from netting ground surveillance radars; the applicability of existing or modified existing radars to meet BSTAR requirements; and the effectiveness of expanding BSTAR requirements to include detection and reporting of personnel movements, fixed target detection, and aircraft detection for cueing air defense systems. Prepare technical specification, coordinate within Army, evaluate contractor proposals, award contract to begin advanced development of BSTAR radar.

3. FY 1980 Planned Program: Continue contractual efforts to develop BSTAR radar; prepare for DT/OT I.

4. FY 1981 Planned Program: Continue contractual efforts to develop BSTAR radar, and initiate training, and logistics actions to support fielded system.

5. Program to Completion: BSTAR advanced development will conclude in FY 1983. Conclude DT/OT I, evaluate results of testing, conduct in-process review to determine readiness to enter engineering development.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.21.A
Title: Chemical Defensive Materiel Concepts
DoD Mission Area: #449 - Chemical-Biological Defense/ Chemical Warfare
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2215	10792	17345	25988	Continuing	Not Applicable
	QUANTITIES						
	5 Gal Decontamination Apparatus						250
	Simplified Collective Protection Shelter						74
	Residual Gas Life Indicator						65
	NBC Collective Protection Systems						12
	Detector Kit for Chemical Agent in Water						506
	Automatic Liquid Agent Detector						175
	Remote Sensing Chemical Agent Alarm						56
	Chemical Attack Warning System						1050
DE80	Individual Cml Protection Materiel	0	0	500	1930	Continuing	Not Applicable
DE81	Cml Decontamination Materiel	1250	1869	5034	3221	Continuing	Not Applicable
DJ30	Collective Protective Materiel for Armored Vehicles	0	0	3941	6341	Continuing	Not Applicable
D601	Cml Detection & Warning Materiel	185	4683	4860	11054	Continuing	Not Applicable
D604	Collective Cml Protection Materiel	780	4240	3010	3442	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: There is an urgent need to provide all Services with an improved rapid detection and warning system which will provide US Forces with early warning of an approaching chemical agent attack, and improved individual and collective protection materiel and equipment to protect against chemical attack, whether in vapor or liquid/aerosol form. The Army has the Executive Agent responsibility for conducting chemical biological defense research and development DOD-wide. This PE covers defensive systems and equipment to protect individuals and groups from chemical agents by providing: protection for the respiratory system and body surface; manual and automatic detection and warning devices that respond to toxic agents in all forms on all surfaces; means to decontaminate skin, clothing, equipment, and

terrain; and the development of collective protection for shelters, armored vehicles, vans and associated equipment. Failure to correct these (Nuclear, Biological-Chemical) NBC defense deficiencies would seriously jeopardize the survivability of US Forces in the event of a chemical attack.

C. BASIS FOR FY 1980 RDTE REQUEST: Complete Advanced Development (AD) on remote sensing chemical agent alarm. Prototype hardware will be designed, fabricated, and tested for the automatic liquid agent detector (ALAD), advanced chemical agent detector alarm (ACADA), and detector kit for chemical agents in water. The residual gas life indicator will be used in a series of tests to determine reliability and performance. Fabrication, test, evaluation, and modification will continue on prototype collective protection equipment for combat vehicles and crews. Conduct advanced development of individual, equipment, and terrain/facility decontamination materiel to improve the chemical decontamination capability of US Forces and their ability to operate in a chemically contaminated environment.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	3517	10792	13316	Continuing	Not Applicable

The difference between the FY 1978 columns (FY 1979 vs FY 1980 submission) is due to the inclusion of funds in the FY 1979 submission to support advanced development (AD) of the remote chemical agent alarm, XM21. No advanced development work was done on the XM21 in FY 1978, therefore, those funds were reprogramed. The FY 1980 RDTE Congressional Descriptive Summary includes additional funding to support an accelerated R&D program to provide near-term improvements in the US chemical decontamination capability. Current standard US decontamination equipment and materials (decontaminants) are not adequate to respond to the threat posed by known threat-nation chemical warfare capability. Additionally, the FY 1980 summary includes a new project (PE: 6.37.21/DJ30) which supports the advanced development of new and improved NBC collective protection equipment for armored vehicles and crews. The FY79 Congressional budget request did not include these accelerated/new programs because these efforts were developed after completion of the FY79 RDTE program.

E. OTHER APPROPRIATION FUNDS: ($ in thousands): None.

Program Element: #6.37.21.A
DOD Mission Area: #449 - Chemical-Biological Defense/ Chemical Warfare

Title: Chemical Defensive Materiel Concepts
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program element is to conduct advanced development for all Services on rapid detection and warning systems, and protective materials and equipment to warn of the presence of and to protect against chemical attack. This element covers defensive systems and equipment to protect individuals from chemical agents by providing: protection for the respiratory system and all body surfaces; manual and automatic detection and warning devices that respond to toxic agents on all surfaces, in the atmosphere, and in food and water; and means to decontaminate skin, clothing, equipment, and terrain. This element also provides for the development of collective protection equipment/materiel to provide rest and relief to personnel performing certain headquarters and communications functions, and for certain, armored vehicle crews to relieve the stresses and restrictions inherent in wearing individual protective equipment while performing their mission in an active chemical environment.

G. RELATED ACTIVITIES: The approval of the Memorandum of Understanding (MOU) with Canada for protective mask canisters is pending. The Army approved required operational capability (ROC) for the New Protective Mask, XM29, has been converted to a joint Service operational requirement for multi-service application.

H. WORKED PERFORMED BY: US Army Chemical Systems Laboratory, Aberdeen Proving Ground, MD; US Army Large Caliber Weapons Systems Laboratory, Picatinny Arsenal, Dover, NJ; Arctic Test Center, Fort Greeley, AL; Tropic Test Center, Panama. Contractors are Sierra Engineering Company, Sierra Madre, CA; Ayo Company, North Bayshore, Long Island, NY; Gentry Corporation, Carbondale, PA; Utility Research Company, Montclair, NJ; and Block Engineering, Cambridge, MA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Advanced development was initiated on the Remote Sensing Chemical Agent Alarm, XM21 in 3QFY74 and halted in FY75 by Congressional directive. Efforts on the XM21 since FY75 have been limited to intermittent preparation for, and conduct of comparative testing of two alternative technical approaches: long path infrared (LOPAIR), and forward looking infrared (FLIR). The comparative evaluation was concluded early FY78. No advanced development work on the XM21 was performed during FY78. The New Protective Mask, XM29 program entered the engineering development phase during 4QFY77. During FY78, the Army's plan for incorporation of NBC collective protection in combat vehicles was implemented. To quantify existing information gaps relative to NBC protection for combat vehicles and crews, the following tests have been conducted on an M113 Armored Personnel Carrier and an M60 Tank as typical combat vehicles: (1) Ventilation (infiltration studies), (2) leakage determination, (3) leakage reduction, (4) liquid and vapor agent transport, (5) residual contamination, and (6) hazard assessments. Data gathered will be used for future design and corrective actions. Also, during FY78, a review of the Army's (and other Services') chemical decontamination capability, resulted in the Army's decision to initiate an accelerated program to improve this capability.

Program Element: #6.37.21.A
DoD Mission Area: #449 - Chemical-Biological Defense/ Chemical Warfare

Title: Chemical Defensive Materiel Concepts
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Advanced development (AD) of the remote sensing chemical agent alarm will be reinitiated. Continue AD on the 19 litre decontamination apparatus for vehicles and decontamination procedures for weapons systems. Initiate AD on: (a) decon system for clothing (NBC overgarments); (b) vehicle interior surface decon system; (c) special applications decon system (for wiring, optics, aircraft and sensitive surfaces, etc.); (d) decon station kit (large scale personnel decon); and (e) a field decon system (modular, Brunswick design TMS-65, mobile system for rapid decon of equipment or personnel). Initiate AD on a detector kit for chemical agents in water. The vehicle information gap study program will be expanded and cover areas such as: ventilation parameters, mathematical modeling of hazard assessment, liquid agent transport, transport due to personnel entry, and crew compartment decontamination.

3. FY 1980 Planned Program: Remote sensing chemical agent alarm hardware will be designed and fabricated, along with necessary software, for field test and evaluation in the widest possible range of potential use environments. Automatic liquid agent detector hardware, incorporating advancement and optimizations from earlier AD efforts, will be designed, fabricated, and tested in the laboratory against agents and simulants. Complete AD on: (a) decon system for clothing; (b) interior surface decon system; (c) decon procedures for weapons systems; and (d) decon apparatus for vehicles. Continue AD on: (a) special applications decon system; (b) decon station kit; and (c) field decon system. Initiate AD on: apparatus for rapid decon and individual decon set.

4. FY 1981 Planned Program: This is a continuing program which supports AD of new decontamination Systems, detection and warning systems, and collective protection equipment for shelters, armored vehicles, vans, and associated equipment. AD on residual gas life indicator, simplified collective protection for field shelters, special applications decon system, decon station kit, and field decon system will be completed in FY81. AD will continue on the other starts initiated in FY79. Tri-Service requirements will be initiated as required.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DE81 Title: Chemical Decontamination Materiel
Program Element: #6.37.21.A Title: Chemical Defensive Materiel Concepts
DoD Mission Area: #449 - Chemical/Biological Defense/ Chemical Warfare Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The USSR and Warsaw Pact possess a formidable chemical warfare capability which if employed against our Forces would have serious impact on our ability to survive and fight. A means of ensuring our survivability is to have an effective means of removing or reducing the hazards posed by any chemical agents deposited on our troops, equipment, critical terrain or facilities. This project supports the accelerated actions needed to provide our Forces with an initial broad-based decontamination capability for decontamination of skin, vehicles, aircraft, special weapons, special equipment (e.g., optics and wiring), airbase facilities, and shipboard areas. This will also remove surface nuclear contamination, i.e., NBC.

B. RELATED ACTIVITIES: The Army as Executive Agent for chemical-biological (CB) RDTE research, exploratory, and advanced development for all Services, coordinates the decontamination program through technical coordination committees, visits, etc., to ensure the needs of all Services are addressed. Each Service is then responsible for conducting its own engineering development for its unique needs. Thus, there is no duplication of effort. Exploratory development efforts of Program Element/Project 6.27.06/A553: CB Defense and General Investigations, provide the concepts for advanced development conducted under this project.

C. WORK PERFORMED BY: Contractors include Southern Research Institute, Birmingham, AL. Work is also performed by US Army Test and Evaluation Command, Aberdeen Proving Ground, MD; Human Engineering Laboratory, Aberdeen Proving Ground, MD; and US Army Armaments Research and Development Command, Dover, NJ. Chemical Systems Laboratory, Aberdeen Proving Ground, MD, is the in-house Army developing organization.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Prior to FY 1976, little effort was funded in this area. In FY 1976, advanced development of a 19 litre decontamination apparatus for vehicles began. This device provides an improved capability over the standard 1 1/2 quart vehicle decon device. This item should be type classified in FY 1980. In FY 1978, efforts were initiated to develop a water based decontaminant to replace our current standard, decontaminant DS-2 which is inadequate due to its corrosive nature and the fact that there is a need to safely decontaminate sensitive tactical equipment. Also, a contract was awarded to Brunswick Corporation, DeLand, FL, for fabrication of a prototype jet turbine exhaust decontamination apparatus. After delivery of the prototype in March 1979, it will be evaluated for its effectiveness as a rapid decontaminating device.

2. FY 1979 Program: Continue advanced development of a water based decontaminant, 19 litre decon apparatus for vehicle and the decon procedures for weapon system. Initiate advanced development of a decon system for clothing (overgarments); interior surface decon system; special applications decon system (for wiring, optics, etc.,); decon station kit (large scale personnel decon); and a field decon system (modular system for rapid decon of equipment or personnel).

Project: #DE81
Program Element: #6.37.21.A
DoD Mission Area: #449 - Chemical/Biological Defense/ Chemical Warfare

Title: Chemical Decontamination Materiel
Title: Chemical Defensive Materiel Concepts
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Complete advanced development of: decontamination system for clothing; interior surface decon system; decon of weapon systems; and decon apparatus for vehicles. Continue advanced development of special application decon system; decon station kit; and field decon system. Initiate advanced development on the apparatus for rapid decon and the individual decontamination set.

4. FY 1981 Planned Program: Efforts in FY 1981 will be directed towards completion of the initial portion of the accelerated program to give US Forces an improved decontamination capability. Items scheduled for completion include: special application decon system; decon station kit; and the field decon system.

5. Program to Completion: The apparatus for rapid decon and the individual decon set are scheduled for completion in FY 1982. Action will also be initiated to address long-term decon needs during the post FY 1982 time frame.

6. Major Milestones: Not applicable.

7. Resources ($ in thousands):

RDTE	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Funds (current requirements)	1250	1869	5034	3221	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	1250	1869	2300	--	Continuing	Not Applicable
Quantities (current requirements)						Not Applicable
Quantities (as shown in FY 1979 submission)						Not Applicable

Increased funds in FY 1980 reflects the Army's decision subsequent to the submission of the FY 1979 descriptive summaries to accelerate efforts to improve chemical agent decontamination capabilities.

Other Appropriations: Not Applicable.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.22.A
Title: Tactical Operations System (TOS)
DoD Mission Area: #444 - Tactical Combat Integration
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	8776	36772	36482	10000	Continuing	Not Applicable
	QUANTITIES		1				1
D494	Tactical Operations	8776	36772	36482	10000	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Tactical Operations System (TOS) is a computer-assisted command and control system which will increase significantly the capability of ground combat commanders and their staffs to manage the employment of Army combat power. Highly sophisticated automated intelligence and combat surveillance support systems are being fielded to obtain information needed by Corps and Division Commanders and Staffs to "see" the battlefield more clearly to greater depth. The volume of required information generated by these systems is beyond the capability of the current manual system. TOS will provide the required automated assistance to collect, process, store, display, retrieve and disseminate this volume of data quickly to provide commanders accurate, up-to-date information on status, deployment and capability of friendly and enemy forces which is critically needed in combat.

C. BASIS OF FY 1980 RDTE REQUEST: An Army System Acquisition Review Council convened in Jan 78 and provided program direction to upgrade the concept development hardware, and enhance the applications software. The Defense System Acquisition Review Council scheduled for FY78 has been postponed and direction given to continue current TOS program in advanced development. The program plan calls for fielding one Division TOS system at Ft Hood, TX, in FY 80, conducting development and operational testing leading to a milestone decision in FY 82. Concurrently the program will initiate procurement in FY 80 of one Division set for deployment in Europe in FY 82 in response to an urgent operational requirement, which will provide feedback for further enhancements of applications software. The FY 80 funding is required to complete the total system integration, train and conduct testing with one divisional set, procure an additional division set for deployment to Europe, and continue the evolution of applications software. Development of TOS for the Corps will draw heavily on experience and data gained from the TOS Operable Segment (TOS^2) test bed and experience in Division TOS. Requirements for Corps TOS are currently being defined by the US Army Combined Arms Center, Ft Leavenworth, KS.

Program Element: #6.37.22.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Tactical Operations System (TOS)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Defense System Acquisition Review Council (DSARC) II	To be determined	Jan 78 1/
Development Test (DT II) Begin	Mar 80	Mar 80
Field Test Completed	Jul 81	Sep 80 2/
DSARC III	Dec 81	Feb 81 3/

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	6777 4/	100 5/	100 6/	Continuing	Not Applicable

1/ Redirection by Office of the Secretary of Defense to continue in advanced development.
2/ Extended to permit additional training.
3/ Extended to complete test data analysis.
4/ FY78 actual resulting from reprograming (1999) to upgrade Division TOS Software Support Center.
5/ Increased funding results from restructuring Division TOS funding from PE 6.47.49/D197.
6/ Increased funding results from restructuring Division TOS funding from PE 6.47.49/D197.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:						
Funds (current requirements)	0	0	15000	-	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	0	0	-	Continuing	Not Applicable

Program Element: 6.37.22.A
DoD Mission Area: 444 - Tactical Combat Integration

Title: Tactical Operations System (TOS)
Budget Activity: 4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands) (Continued)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Quantities (current requirements)	0	0	1	0	Continuing	Not Applicable
Quantities (as shown in FY 1979 submission)	0	0	0	0	Continuing	Not Applicable

Funds were programed in FY 1979 submission in PE 6.47.49/D197 to purchase a set to deploy to Europe. A decision has been made to purchase that set with Other Procurement, Army funds.

Program Element: #6.37.22.A — Title: Tactical Operations System (TOS)
DoD Mission Area: #444 - Tactical Combat Integration — Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: TOS will constitute an on-line, near real time, tactical automatic data processing system which will provide an improved capability to recieve, process, store, retrieve, display and disseminate selected information required by commanders and their staffs for decision making. Specific objectives are to provide a system to improve command and control capabilities, reduce reaction time, integrate fire support and maneuver, improve operational and decision-making capabilities, provide enhanced capability for use of operations and intelligence data, and improve the speed and accuracy of plans and estimates. Initial efforts in the TOS program were primarily in software and were devoted to automating a slice of a division command and control system using the TOS Operable Segment (TOS^2) austere test bed. Advanced development for TOS conducted under this project D494 has focused primarily on the Division level. Development of TOS for the Corps will draw heavily on experience and data gained from the development of TOS at Division. Requirements are currently being defined by US Army Combined Arms Center, Ft Leavenworth, KS, from Division TOS test bed results and supplemental studies.

G. RELATED ACTIVITIES: The TOS^2 was made up of equipment common to the Tactical Fire Direction System (TACFIRE) Program, Program Element (PE) 2.37.26.A, D322. Division TOS will interface with other systems such as TACFIRE and Corps TOS which will be developed in Project D494, Tactical Operations System (TOS); Equipment and Developments from the Integration of Army Tactical Data Systems Program, PE 6.37.23; and Command and Control, PE 6.47.27, are being integrated into the current Division TOS program to replace most of the TACFIRE components used in the TOS^2 test bed. Project D654, PE 6.37.03.A, Automatic Data Processing Development also has application to the TOS Program. Development for TOS at higher levels, particularly Corps, will follow and evolve out of the Division level development. Continued liaison is conducted at laboratory level and by the Project Manager with developers of automated systems in other Services to preclude unnecessary duplication of effort. In addition, there are numerous tri-Service working groups which ensure a continuous dialogue between systems developers. Corps TOS will interface with Division; the Air Defense Command Control System, AN/TSQ-73; worldwide communications systems; and other intelligence producing systems. Equipment being developed for use in Division TOS and related activities to Division TOS will be related to Corps TOS. Project Manager Tactical Operations System/Operations and Intelligence Tactical Data Systems, under Program Manager, Army Tactical Data Systems (PM ARTADS), US Army Communications Research and Development Command (CORADCOM), Ft Monmouth, NJ, will manage this program to preclude duplication of effort. PM ARTADS provides liaison with other services to ensure a continuous dialogue between interfacing system developers.

H. WORK PERFORMED BY: System integration and coordination is provided by Project Manager, Tactical Operations System/Operations Intelligence Tactical Data Systems, under Program Manager for Army Tactical Data Systems (PM ARTADS), US Army Communications Research and Development Command (CORADCOM), located at Fort Monmouth, NJ. Contractual efforts are being performed by Singer Company, Librascope Division, Glendale, CA; Auerbach Associates, Incorporated, Philadelphia, PA; Control Data Corporation, Minneapolis, MN; Litton Industries, Incorporated, Van Nuys, CA. Contractors have not been selected for Corps TOS.

Program Element: #6.37.22.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Tactical Operations System (TOS)
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: During the Period 1964-1969, the Army developed an experimental TOS in Europe under the direction of US Army Europe (USAREUR/7th Army) using commercial equipment and contractual personnel to evaluate the feasibility and desirability of the TOS concept at Field Army and Corps levels. These experiments became known as EUROTOS. Based on results from these tests, the Army directed its efforts toward the development of a system for the division and its subordinate units. In 1970, hardware and software packages were moved from Europe to Fort Hood, TX, and the experimental system was renamed the Development TOS (DEVTOS). In February 1972, Department of the Army (DA) approved the TOS Systems Engineering Study (SES) which defined the hardware and software specifications for the TOS Operable Segment (TOS^2) test bed and authorized the procurement of Tactical Fire Direction System (TACFIRE) hardware to satisfy the test bed hardware requirements. It was also determined that although TACFIRE hardware purchased for TOS^2 could be considered engineering development (ED) equipment, the software was not developed and the program was more accurately described as advanced development (AD). At the time of the SES approval, the Army further directed that the TOS^2 software would be developed in-house by the US Army Computer Systems Command (USACSC). The software effort began in February 1972, and the TOS^2 hardware contract was awarded to Litton Industries in June 1972. The TOS Development Concept Paper (DCP) was approved by the Office of the Secretary of Defense in September 1972. The FY 1973 effort was devoted to the TOS^2 hardware fabrication and software development. In June 1973, the first increment of the TOS^2 hardware for Software Support System (SSS) was delivered on schedule. In FY 1974, the major effort continued to be the area of software development and completion of the hardware development contract. In August 1973, Director of Defense Research and Engineering was notified of an anticipated 9 month slip of the software acceptance milestone and a potential 3 month breach of the Development Concept Paper (DCP) schedule thresholds. A program review resulted in a revised milestone schedule which slipped the program 9 months and a revised funding profile, which increased Phase I costs but kept the total RDTE cost estimate constant. A revised DCP was approved in June 1974. In October 1974, the TOS Operable Segment (TOS^2) hardware delivery was completed and accepted by Program Manager, Army Tactical Data Systems (PM ARTADS) at Fort Hood, TX. Also in October 1974, the Army reevaluated the US Army Computer Systems Command (USACSC) capability to complete the design and production of the TOS^2 software. This resulted in a 3-year contract for software development assistance to Auerbach Associates, Incorporated, Philadelphia, PA. Software development continued throughout FY 1975. The major thrust of FY 1976 was to continue TOS^2 development and hardware integration. In February 1976, Force Development Test and Evaluation, was initiated; it was suspended by the Project Manager in Apr 76 due to software problems. Following the suspension, the major emphasis during the July-September 1976 timeframe was to improve the TOS^2 software package in preparation for software/hardware integration testing to conduct development test/operational test (DT/OT) during FY 1977. OT I (FM 222) was conducted April-July 1977. Data was gathered for validation of the TOS concept. In January 1978 the Army System Acquisition Review Council (ASARC) approved a continuing program for Division TOS. Corps TOS is expected to use much of the hardware and software being refined for Division TOS.

2. FY 1979 Program: Continue upgrade of TOS^2 system begun in FY78. This includes contractual integration of production and engineering development hardware components from other programs; continued software enhancements; procurement of logistics and training support materiel in preparation for Development Test/Operational Test (DT/OT) II level testing in FY80; and hardware maintenance and support services. Funds are for Division TOS and were restructured from PE 6.47.49/D197. Corps TOS requirements analysis continues through FY 1979. A Mission Element Need Statement is currently in staffing for Corps TOS.

Program Element: #6.37.22.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Tactical Operations System (TOS)
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Complete the integration of a Division TOS system at Fort Hood, TX, conduct Development Test and start training and testing at Fort Hood, TX, in preparation for operational testing to start at Fort Hood in mid FY 1981. Additionally, initiate procurement options for assembly and integration of one additional divisional system for deployment to Europe in accordance with program guidance in response to an urgent operational requirement.

4. FY 1981 Planned Program: Funds shown in this program element in FY81 are for the initiation of Corps TOS efforts. FY 1981 funds for Division TOS will be requested in the FY81 submission. For Division TOS, program is to complete development testing, conduct operational test, analyze data and conduct milestone decision. During FY 1981 software enhancements will continue; logistics and training documentation will be finalized in preparation for European deployment in FY 1982; and interoperability testing will be conducted during follow-on evaluation at Fort Hood with Corps TOS and other emerging tactical data systems. All necessary experimental work will be performed and the system will be ready for full scale development (or production and deployment). TOS prototype development and development test and evaluation will be continued in FY 1981 focusing on software interoperability at the Corps with numerous emerging tactical command and control systems.

5. Program to Completion: The TOS program will continue to be evolutionary, particularly in the areas of software additions and enhancements, folding in new technology in emerging subsystem devices, and conducting of interoperability testing. The FY 1981 DSARC decision point in the division program will address the alternative of continued development or exercise a production option. Corps TOS is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.23.A
Title: Command and Control
DoD Mission Area: #444 - Tactical Combat Integration
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	8077	10984	18590	24563	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D101	Integration of Army Tactical Data Systems (ARTADS)	8077	10984	18590	24563	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The battlefield of today is a highly mobile, fast-changing environment. This fluidity dictates that tactical commanders must be provided the capability to know and understand the complete tactical situation on a near real-time basis to preclude the unexpected, take advantage of aggressor weaknesses, detect potential threats and determine courses of action. To provide the commander with this capability, data from many sources must be received, processed, correlated, and displayed rapidly. Existing manual procedures and techniques are inadequate to handle the large amounts of required data which will be available to the commander. This requirement can only be satisfied through the efficient utilization of automation. Additionally, the numbers and differing types of automated equipments on the battlefield must be reduced if existing software/hardware maintenance and development costs are to be reduced. This program pursues these goals through a disciplined engineering approach, insuring the integration of Army tactical data systems in a coherent total program to accelerate the fielding and improve the survivability of all automated Army systems. The approach is to provide common interoperable families of computers, transportable software products and tools (including a common tactical high-order language), intelligent input/output devices (terminals, displays, ancillary memories, etc.), and to provide management support as well as test beds for system validation, experimentation, and integration/interoperability testing. The development of a standard set of integrated data processing computers and peripherals having a wide applicability will permit system developers to concentrate on development of the application system, thereby shortening existing development times and will decrease the logistics burden once the system is fielded.

C. BASIS FOR FY 1980 REQUEST: Major external efforts will commence in support of joint Service development of the Military Computer Family (MCF); similar large efforts will be initiated for MCF-compatible interoperable intelligent terminals and peripherals, and supportive development for a tactical display. Efforts will expand on testing tactical system interoperability, developing transportable software tools and products, and advanced concepts supporting future MCF and embedded computer systems. Engineering support for Army tactical data system development programs will continue.

Program Element: #6.37.23.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Command and Control
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	8257	10984	19759	Continuing	Not Applicable

Producibility planning and scheduling requirements for MCF models, development and enhancement of intelligent microprocessor-based terminals, and increased experimentation in systems interoperability and standardization are responsible for the increased funding requirements from year to year. Funding for FY 1978 and FY 1980 is less because emphasis was placed on higher priority items.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.23.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Command and Control
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program provides for development of a software/plug compatible family of military computers (MCF), intelligent microprocessor-based terminals and peripheral devices, data distribution and similar hardware/software subsystems, tools and facilities for utilization by application system developers. The Center for Tactical Computer Systems Teleprocessing Design for multiple system interoperability testing, verification and validation, and MCF demonstration model, is included in this element. This project also ensures that technical and managerial support will be given project managers, system developers, laboratories, centers, and other Army organizations in the development and acquisition of tactical systems utilizing computer resources. Advanced development and enhancement of tactical computer-based components are included in this project.

G. RELATED ACTIVITIES: This project is related to the Tactical Operations System (TOS), 6.47.49.A; Tactical Fire Direction System (TACFIRE), 2.37.26.A; Communication-Electronics, 6.27.01.A; Automatic Test Support Systems, 6.47.46; Missile Minder (AN/TSQ-73), 6.43.02.A by developing new technology, tools, equipment, interfaces, and systems engineering for these systems.

H. WORK PERFORMED BY: Control Data Corporation, Minneapolis, MN, $851K; contracts to be awarded FY 1979, $9642K.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: A computer resource market survey was completed for the Military Computer Family (MCF). The Vice Chief of Staff of the Army was briefed on an accelerated MCF program, and agreed with its continuation. Similar progress was made in developing form, fit, and function (f^3) specifications for modularization of characteristics of MCF-compatible terminals/peripherals. Development continued on large screen Tactical Display System (TDS). Work progressed on the Interface Message Device used in the universal TACFIRE/TOS interface. Efforts were coordinated with Germany for developing specifications for a TDS-compatible overlay generator. The Teleprocessing Design Center (TDC), activated by PM ARTADS, has been used to verify interoperability between TACFIRE and the Tactical Operating System Operable Segment (TOS^2). Plans were made to interface commercial and tactical systems over a secured communications network. Studies were initiated to develop strategies for Post-Deployment Software Support (PDSS). Selection of the Department of Defense (DOD) common language was narrowed down to two candidate languages needing refinement, and plans were prepared for Army development of a DOD common language compiler. Technical and managerial support was provided to Army organizations (e.g., Project Manager, Army Tactical Data Systems, the Center for Tactical Computer Sciences) in the development and acquisition of tactical systems utilizing computer resources. Study efforts in the area of built-in test transitioned to this project for f^3 specifications and the f^3 specifications for the MCF-AN/UYK-41(v) were modified to include BIT. A revised standard (MIL-STD-1462A) was prepared as a test programing language for Automatic Test Equipment systems. Work progressed on a maintenance information delivery system.

Program Element: #6.37.23.A
DoD Mission Area: #444 - Tactical Combat Integration

Title: Command and Control
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: The computer resource market survey will be expanded to include intelligent terminals. Efforts will be made in areas of market research, developing form, fit, functions specifications, qualification of subsystems and facilities, and integration, test and evaluation of Tactical Operations System (TOS) model system. Efforts to continue in areas of built-in test, architectures, and integration of reconfigurable modular systems. A major effort to develop the family of military computers (MCF) demonstration model system integration and validation will be started as well as an effort to develop an overlay generator as an adjunct terminal for the Tactical Display System (TDS). The Teleprocessing Design Center will be used in conducting interoperability and integration tests with the Tactical Fire Direction System (TACFIRE), TOS, Center for Communications and the Joint Interoperability of Tactical Computer Systems program. Work will continue in developing secure networks. Efforts on the DOD common language selection and language-dependent tools will continue. Post-Deployment Software Support will be expanded to a Army-wide basis. Work will continue on the Software Development/Support System. Efforts will be made in managing and planning for integration of Army Tactical Data Systems with appropriate feeder systems as well as system engineering support contracts. Planning will commence regarding incorporation of built-in maintenance/test into the MCF systems architecture, and work will begin on studies for an advanced test programing system. Work to continue on maintenance information delivery system.

3. FY 1980 Planned Program: Efforts will continue in areas of subsystem producibility integration of computers, intelligent terminals and peripherals, as well as planning, standardization, control and improvement of the military computer family (MCF) architectures. Form, fit, functions specifications are planned to be updated and validated via testing of MCF Demonstration Model System Integration. The Teleprocessing Design Center will support MCF efforts, perform interoperability experiments with TACFIRE/TOS, validate software interfaces, and begin design of a secure computer network. Verification and validation will be performed on DOD common language design and its associated software products. Work will commence on a prototype secure tactical operating system and its associated software integration and support, operational support, and communication interfacing to be completed. Planning and management of integration of Army Tactical Data Systems with their associated feeder systems will continue. A continuation of systems engineering support is anticipated in meeting MCF requirements. Maintenance and logistic support for MCF, with emphasis on built-in test and embedded logistics concepts, will be continued to satisfy MCF program goals.

4. FY 1981 Planned Program: Support of the MCF program will continue with efforts now concentrating on system producibility and the integration of computer, peripheral, and intelligent terminal subsystems. Coordination of planning, standardization, control, and improvement will involve system architectures. Built-in test and built-in security planning for internally supported MCF demonstration model to continue. Validation and verification of form, fit, and function specifications for MCF subsystem to continue. Interoperability experiments on TOS and other systems will continue, as will investigations into developing a secure computer network. Verification and validation efforts on the DOD common language and its dependent tools will be completed. Plans will be initiated for a family of real-time tactical data base management systems. The prototype tactical operating system will be tested. The Software Development/Support System will be enhanced and used for integration of software. A continuation of support for acquisition and integration of Army tactical data systems with their feeder systems, as well as expansion of external systems engineering support to satisfy MCF requirements, is anticipated. The logistics concept study, with additional emphasis on built-in test for computer peripherals and intelligent terminals, will be continued in support of MCF requirements. Work is to be resumed on maintenance information delivery system.

5. Program to Completion: Support of the Military Computer Family (MCF) program is anticipated as continuing in the following areas: systems producibility, and integration for computer, form, fit, and function (f^3) Military Computer Family (MCF)-compatible intelligent terminals and peripheral subsystems; planning, standardization, control, and improvement of system architectures; built-in testing and built-in security planning; integration, validation, and acquisition of the MCF demonstration model. The Teleprocessing Design Center will continue to support development, test, and validation of MCF hardware/software subsystems/facilities. Interoperability testing and securing computer networks to continue, with true interoperability of delivered systems on secured network to commence. Enhancement of DOD common language compiler to continue, and a transportable secure tactical operating system family will be made available for PM usage. Integration and operation of software tools to be completed. Work to continue on intelligent distributed operating systems. Computer market surveys will continue to be updated and expanded in support of MCF program. A new external systems engineering support effort will commence for continued acquisition and integration of Army tactical data systems and for post-deployment support, policy, procedures, guidelines, standards, and training packages. Detailed MCF maintenance requirements for input to the embedded maintenance training concept will be continued, as will development and enhancement of maintenance information delivery system.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.26.A
Title: Combat Support Equipment
DoD Mission Area: #442 - Logistics/General Combat Support
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4784	7886	8751	12949	Continuing	Not Applicable
D601	Combat Engineer Equipment	3383	4050	2900	5256	Continuing	Not Applicable
D614	Container Distribution Equipment	266	440	230	220	Continuing	Not Applicable
D639	General Support Equipment	253	916	748	590	Continuing	Not Applicable
D641	POL Distribution Systems	100	1208	3863	2355	Continuing	Not Applicable
D428	Tactical Rigid-Wall Shelters	0	250	400	1048	Continuing	Not Applicable
D471	Camouflage	712	1022	440	2850	Continuing	Not Applicable
D526	Marine Oriented Logistics Equipment	70	0	170	630	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army requires new and advanced logistical support equipment to meet the requirements of ship-to-shore and over-the-beach resupply operations, as well as the requirements of deployed forces in support of various military contingencies. In the event that port facilities are unavailable, commercial containerships and fuel tankers must be assisted by military equipment capable of off-loading, transporting, and handling containerized supplies and bulk fuel. A primary objective of this element is to provide this equipment for logistics resupply. This program also provides the Army with materiel that will increase the Army's tactical mobility and reduce the burden of logistic resupply through: a new family of tactical bridging to provide improved capabilities for crossing rivers and other natural barriers, new water purification equipment that can provide potable water more efficiently than can existing equipment, new and more efficient environmental control equipment (heating/air-conditioning), and enhanced survivability via new camouflage techniques to defeat enemy surveillance threat.

C. BASIS FOR FY 1980 RDTE REQUEST: Complete advanced development (AD) of composite bridging components for Bridging for 1985 and Beyond and develop components for a rapidly deployed petroleum pipeline and a low temperature refueling system. Complete AD of a rapidly deployable sectionalized barge. Continue AD of application of metal matrix composite materials to bridge structures, access/egress hardware for current inventory tactical bridging, wastewater treatment components for battlefield wastewater recycle/reuse, prototype countersurveillance hardware, fabric bulk fuel storage tank, multipoint airfield refueling system, and a prototype tactical rigid-wall shelter. Begin AD of assault hoseline system for fuel distribution, a fuel hoseline system for river crossing, and techniques to detect clandestine tunnels.

Program Element: #6.37.26.A
DoD Mission Area: #442 - Logistics/General Combat Support

Title: Combat Support Equipment
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	3464	8486	16806	Continuing	Not Applicable

The increase in FY78 was due to increased funding for the trilateral bridging program in Project DG01. The reduction in FY79 was due to Congressional deletion of 60-ton amphibian development in Project D526. The reduction in FY80 is caused by anticipated requirements which have not materialized, resulting in funding reductions in five of the seven projects. Development of bulk petroleum distribution systems was given increased emphasis and funding to provide more efficient combat refueling capability.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.26.A
Title: Combat Support Equipment
DoD Mission Area: #442 - Logistics/General Combat Support
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program element supports the advanced development (AD) of various items which are essential to enable the Army to provide the logistic and combat support functions during combat and contingency operations, to include, the capabilities for rapid combat engineer construction, resupply of increasingly greater amounts of containerized cargo, mobile salt water purification units, environmental control for shelters and vehicles housing critical electronic equipment and personnel in all climates, resupply of bulk fuels, oils, and lubricants (POL), techniques and equipment to counter the surveillance threats, tactical shelters to replace vans, and marine-oriented logistics support items for ship-to-shore movement of supplies.

G. RELATED ACTIVITIES: Coordination to avoid duplication and provide program guidance is accomplished through trilateral (United States, United Kingdom, and Federal Republic of Germany) agreement and the Steering Committee for Bridging for 1985 and Beyond, Department of Defense Joint Container Steering Group, Joint Committee on Tactical Shelters, and Project Manager for Army Container-Oriented Distribution System. Related exploratory development programs are in Program Element (PE) 6.27.23.A, Clothing, Equipment, and Shelter Technology; and PE 6.27.33.A, Mobility Equipment Technology. Items in this PE progress to engineering development in PE 6.47.17.A, General Combat Support.

H. WORK PERFORMED BY: In-house efforts are performed by the US Army Mobility Equipment Research and Development Command, Fort Belvoir, VA; the US Army Engineer Waterways Experiment Station, Vicksburg, MS; and the US Army Natick Research and Development Command, Natick, MA. Contractors include Pacific Car and Foundry, Renton, WA; Brunswick Corporation, Marion, VA; UOP Corporation, San Diego, CA; Johns-Manville, Denver, CO; Air Research Manufacturing Company, Phoenix, AZ; and additional planned contracts totaling $5,400,000.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Completed fabrication of 31 meters of prototype bridge and associated bridge ancillary items including reinforcing system, wheeled vehicle launcher and launching mechanism. Finished concept formulation for Total Environmental Control System (18,000/30,000 British Thermal Units per hour (BTUH)) and awarded contract for prototype. Fabricated and successfully tested several designs of ammunition restraint kits for conversion of commercial containers to movement of ammunition. Bought and tested pumps, filters, and feeders for use with Reverse Osmosis Water Purification Units (ROWPU). The initial design for a low temperature refueling pump was completed. An improved design of a projected smoke system was favorably evaluated. The camouflage net support system for the 155mm self-propelled howitzer was favorably evaluated by the Field Artillery Board and is being studied by the Field Artillery School preparatory to developoing a requirement document. Completed a camouflage concept analysis on the LANCE missile unit. Distributed the first edition of the Camouflage Design Guide for Army Equipment Developers. A signature analysis was completed on the sensor/target relationships for Command Posts.

2. FY 1979 Program: Complete fabrication of three additional seven meter bridge bays and conduct tests of 52 meter bridge with both steel and Kevlar reinforcing system. Design, fabricate, and test floating attachments to convert dry gap support bridge to wet gap support bridge. Conduct mobility tests with 31 meter bridge mounted on M60 chassis, and fabricate and test transporter/

launch handling system with two connected ribbon bridge bays. Complete advanced development (AD) of Total Environmental Control System (TECS-18). Develop clarifiers, carbon absorption columns, and oxidizers for waste water treatment for recycle/reuse. Buy scale model Kevlar or other high strength fabric fuel storage tank and initiate testing. Initiate tests of 600 gallons per minute pump for low temperature fueling system. Begin designs of a quick connect coupling for a rapidly emplaceable petroleum pipeline outfit, and a 50 foot accordion type shelter. Continue AD of camouflage, obscurants, and decoy hardware and techniques with empahsis on thermal signature suppression, HAWK decoys, and howitzer net support system.

3. FY 1980 Planned Program: Complete the fabrication of composite bridge components. Procure prototype hardware for improving access/egress for current inventory tactical bridging and initiate tests. Continue evaluation of the application of metal matrix composites to bridge structures in the joining, forming, and loading areas. Perform component analysis of potentially feasible techniques to detect tunnels. Begin design of prestaged loading system for containerized ammunition. Continue AD of field generated waste water treatment components, and obscurants. Complete evaluation and testing of components for rapid petroleum pipeline coupling and the low temperature refueling system, and initiate total system designs extending to the ultimate use ie Tank or IFV. Buy full scale prototype fabric fuel tank and prototype 50 foot accordion shelter. Continue AD of a multipoint airfield refueling system and begin development of an assault hoseline and a river-crossing hoseline. Initiate AD of 60-ton high speed amphibian resupply lighter (emphasis on adaption of Navy assault craft) for containers discharge and 120-ton towable barge for general cargo handling.

4. FY 1981 Planned Program: Continue AD and testing of bridging components, metal matrix composite materials applications, and access/egress solutions for current inventory bridging. Continue to characterize means of detecting clandestine tunnels. Evaluate prototype lightweight amphibious container handler. Fabricate test prototype of prestaged ammunition loading system. Continue AD of arctic fuel dispensing system and high strength fabric tanks for bulk fuel storage. Start testing of bulk fuel assault hoseline system, particularly the rapid pickup and deployment device for the hose. Complete preliminary hardware design for automated pipeline construction equipment, and the testing of process components for wastewater recycle/reuse. Buy prototype equipment for field preparation/mixing of fire safe fuel. Start AD of two simple, rugged electric heaters. Conduct Development Test I/Operational Test I (DT I/OT I) on 50 foot accordion shelter. Complete AD of instant smoke system. Assist users and developers in integrating camouflage techniques into the Army's tactical/combat operations. Start AD of radar absorbent materials and clutter simulators to defeat enemy radar. Develop camouflage design goals/standards for camouflage critical and camouflage sensitive items and units. Initiate AD of 60-ton high speed amphibian resupply lighter.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.30.A
DoD Mission Area: #424 - Tactical Reconnaissance

Title: Tactical Surveillance System
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT					Continuing	Not Applicable
	QUANTITIES						
D560	Tactical Surveillance System					Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element (PE) supports the Army's Tactical Exploitation of National Capabilities (TENCAP) program (Part A) which is directed toward developing a tactical support system to receive, process, and disseminate intelligence/information from multiple sources which locates enemy units, activity and targets representing a general tactical threat. Such intelligence/information is essential to the tactical commander to enable him to fight and win while outnumbered in a highly intensive, but short duration conflict. The tactical commander must have the capability to locate, identify, engage and attrite superior enemy forces at maximum range to insure that a manageable combat power ratio exists in the main battle area. The tactical commander must also have the capability to seize the initiative from the enemy by blunting his strength and exploiting his weaknesses. Since the enemy has the advantages of great numerical superiority and the choice of time, location and nature of an attack, friendly forces must rely heavily on superior intelligence systems to counter these advantages. In the TENCAP Program, advanced techniques are applied to exploit information collected from a variety of Controlled sensors, which, in general, is not otherwise obtainable, and provide that information to the tactical command and control environment in a sufficiently timely and useful form to greatly assist the commander in defeating the enemy.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue AD work on hardware/software interfaces between existing and future sensor systems and Army tactical exploitation systems. Conduct system/subsystem tests and demonstrations in conjunction with tactical exercises to assess the performance gains resulting from the use of new tactical surveillance systems.

Program Element: #6.37.30.A
DoD Mission Area: #424 - Tactical Reconnaissance

Title: Tactical Surveillance System
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE Funds (as shown in FY 1979 submission)	-	-	-	Continuing	Not Applicable

Differences between FY 1980 and FY 1979 budget submissions are attributable to a $5.7M difference between the FY 1979 budget request and the FY 1979 appropriation. The distribution of the $5.7M shortfall between program elements 6.37.30 (D560) and 6.37.45 (D907) was left to the discretion of the project manager. The FY 1979 funding of this project was reduced by $3.2M. Change in FY 1980 request is based upon refinement of estimate as better data became available.

E. OTHER APPROPRIATION FUNDS: None.

Program Element: #6.37.30.A Title: Tactical Surveillance System
DoD Mission Area: #424 - Tactical Reconnaissance Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Data originating from a variety of _ and tactical surveillance sensors must be transmitted to central collection points where the data can be processed and analyzed. The resulting tactical intelligence must then be rapidly disseminated and fuzed into the command and control environment in such a timely and useful form as to materially influence the land battle. Techniques and equipment which will provide for this rapid collection, transmission and manipulation of intelligence data are being developed under this program.

G. RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link and data compression technologies, and tactical identification and positioning. The use of satellite communications is being considered. This work is coordinated with appropriate departments and agencies. Program Element (PE) 6.47.40 covers engineering development (ED) work which is related to this PE.

H. WORK PERFORMED BY: RCA Corp., Camden, NJ; TRW, Los Angeles, CA; Aerospace Corp., El Segundo, CA; US Army Electronic Research and Development Command (ERADCOM), Adelphi, MD; Electromagnetic Systems Laboratories, Sunnyvale, CA; Ford Aerospace Corp., Palo Alto, CA; Systems Planning Corp., Arlington, VA; MRJ, Inc., McLean, VA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Studies were completed which provide the technical base for the equipment and techniques for design and development of a tactical receipt/exploitation system. The definition of system interface specification was begun for an advanced exploitation system. Design studies for four subsystems were completed. The development and installation of interfaces with two subsystems was initiated. One subsystem interface specification was completely defined.

2. FY 1979 Program: The systems interface elements for one system will be completed and tested. Necessary experimental work will be completed and the first system will provide an engineering demonstration. System development for interface with a second collection system will be continued. Advanced development (AD) of subsystems for an advanced exploitation system will be continued.

3. FY 1980 Planned Program: Advanced system development for interface with a second collection system will be completed. Operational testing (OT) and developmental testing (DT) will be performed by the program executive agent. Development of interface with other collection systems will continue.

4. FY 1981 Planned Program: The development of advanced subsystems/systems for improved interface with and exploitation of other collection systems will continue.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.37.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Anti-Radiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands):

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT					Continuing	Not Applicable
181	Anti-Radiation Missile Countermeasures					Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:

This program element provides the broad, nonsystem-specific technology base for the development of countermeasures to the anti-radiation missile threat. The program is oriented at developing countermeasures applicable to ground surveillance, counterbattery, and air defense radars, along with special classes of communications terminals and electronic warfare equipments. The effort addresses five areas of activity: threat evaluation and simulation; countermeasures development; laboratory simulation and testing; establishment and maintenance of a tri-Service field test capability; and support of Tri-Service Joint Working Group on Anti-Radiation Missile Countermeasures.

C. BASIS FOR FY 1980 RDTE REQUEST:

reduce test data from HAWK and ROLAND field tests;

support to Tri-Service ARM-CM Working Group.

provide

Program Element: #6.37.37.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Anti-Radiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	[illegible]		[illegible]	Continuing	Not Applicable

Difference in FY 1978 profile is due to internal reprograming actions to meet higher priority unfinanced requirements.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.37.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Anti-Radiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION:

These systems are relatively complex and expensive, and serve a critical roll for the Army in the field.

The objectives of this program are to characterize and simulate the known threat missile systems, develop appropriate countermeasures, provide laboratory and field test instrumentation, and provide tri-Service data exchanges and development capability.

G. RELATED ACTIVITIES: Development of anti-radiation missile countermeasures (ARM-CM) is conducted by the three Services with the Army being the lead Service. The threat data and simulations, countermeasure technology, and field test instrumentation developed within this program are utilized within the specific system ARM-CM development activities done in Program Elements 6.43.07.A (PATRIOT), 2.37.31.A (Improved HAWK), 6.43.09A (ROLAND), and 6.37.29.A (Counterbattery Radar). The Navy has conducted work in Program Elements 6.35.16.N (Radar Surveillance Equipment), and by the Air Force in 6.37.18.F (Electronic Warfare Technology) and 6.37.05.F (Counter-Countermeasures Advanced Development). The field test instrumentation and simulations developed under the Project D181 directly support the Navy and Air Force work. The three Services routinely coordinate their respective Service programs via the Tri-Service Joint Working Group on ARM-CM.

H. WORK PERFORMED BY: Current Contractors are Analytics Incorporated, Willow Grove, PA; Computer Science Corporation, Huntsville, AL; General Dynamics, Pomona, CA; System Planning Corporation, Arlington, VA; and HRB-Singer, State College, PA. The in-house developing organizations responsible for executing the program are Harry Diamond Laboratory, Adelphi, MD; the US Army Missile Research and Development Command, Redstone Arsenal, AL; and Naval Weapons Center, China Lake, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: This program was initiated in March 1976. The following has been accomplished: potential ARM targets have been identified and are being characterized; all available intelligence data has been searched; the threat is being characterized and simulated. Laboratory instrumentation - the generic seeker - was developed and was ready for delivery at end of FY 1978. Digital simulations of friendly ARM's have been completed.

Data reduction is nearly completed. For improved field testing, a helium balloon was purchased and appropriate instruments installed. Aircraft mounted instrumentation was also developed and will be used in FY 1979 field tests.

Program Element: #6.37.37.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Anti-Radiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: The generic seeker will be installed in a Radio Frequency Source Simulator, and simulations will be run to do laboratory evaluations of the HAWK ARM-CM's. Following the HAWK lab tests, evaluations will be run on proposed PATRIOT ARM-CM techniques. While the laboratory tests with the generic seeker are run, a flyable control module will be developed. This module when integrated with the generic seeker, will constitute a "flyable" generic seeker. This will be installed on an A-3 aircraft for use in HAWK and ROLAND field tests. HAWK and ROLAND ARM-CM field tests will be conducted in 3d and 4th quarter FY 1979.

The passive decoy concept will be further explored, hardware definition will begin, and a field test scenario will be developed with hardware and field test to be executed in FY 1980.

Development of computer simulations of threat ARM's will continue.

3. FY 1980 Planned Program:

Field test instrumentation will be maintained and improved.

Modifications to the generic flyable seeker will be initiated to incorporate a dual mode capability.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.40.A

Title: Short Range Air Defense Command and Control (SHORAD-C^2) Systems

DoD Mission Area: #414 - Army Field Air Defense

Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	500	3000	3600	28400	35500
	QUANTITIES						4
D593	SHORAD-C^2 Systems	0	500	3000	3600	28400	35500

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Short-range air defense (SHORAD) weapon capabilities have outstripped force commander's ability to manage air defense operations effectively. The present command and control (C^2) system for use with SHORAD weapons is a manual system augmented by the Forward Area Alerting Radar (FAAR) and Tactical Alerting Data Display Set (TADDS). It is based on locally established rules and procedures promulgated by Standing Operating Procedures (SOPs), liaisons, and mutual understandings. The FAAR/TAADS semi-automatic alerting system provides detection to the FAAR operator and uses Frequency Modulation (FM) data links to transmit manually processed information to the user. The present C^2 system does not provide SHORAD fire units timely and accurate sensor information to support detection, identification and engagement processes. The consequences of this deficiency are missed opportunities to engage the air threat and risk to friendly aircraft. Further, the present C^2 system does not provide for effective flow of air battle management information. This results in incomplete knowledge to support battle management decisions and slow, error prone dissemination of airspace control orders. A new SHORAD C^2 system will improve the gunner's median aircraft detection range and identification range. Army and Marine Corps studies and field tests have shown that this results in an increased relative effectiveness of the SHORAD air defense force by a factor of 2 to 4. The C^2 system will improve the effectiveness of the Division Air Defense (DIVAD) by integrating weapons, sensors, and command posts into a single functional system thereby enhancing combat power of weapons, conserving resources, and reducing the risk to friendly aircraft. The primary thrusts of this program are: (1) to develop the basis for the Concept Formulation Package (CFP) for a SHORAD-C^2 system; (2) to determine the 1983 SHORAD-C^2 and communications system requirements for the effective and efficient performance of the SHORAD weapons in protecting the division's assets while affording maximum protection to friendly division airspace users; (3) to determine how the 1980 SHORAD-C^2 system could evolve smoothly into the 1983 SHORAD-C^2 system which will incorporated the new all-weather air defense and the restructured division organization, and evolve with the Army's future communication system; and (4) to provide the data base and methodology for the study of air defense C^2 requirements at echelons above division.

Program Element: #6.37.40.A Title: Short Range Air Defense Command and Control (SHORAD-C^2) Systems

DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: $200K internal support for technical management and Integrated Logistics Systems (ILS) management program at the US Army Communications Research and Development Command (CORADCOM), $600K for contract engineering/ integrating the intradivision test bed planning test scenarios, $2200K for procuring selected test bed equipments and investigate modifications required in STINGER, I-CHAPARRAL/ROLAND, FAAR target acquisition systems and VULCAN/DIVAD-GUN. Evaluate communications equipments and technologies as required for a fieldable SHORAD-C^2 system. Based on Intra-Army Technical Interface Concepts (TIC) and developing Technical Interface Design Plans (TIDP's) document initial system compatibility and interoperability requirements, initiate procurement action to obtain selected equipments for test bed experimentation facility. The operational knowledge produced from the test facility, combined with the results of the concurrently ongoing combat development specific requirements and test criteria definition, will be the basis for concept formulation and material need documentation for the SHORAD-C^2 system.

Major Milestone	Current Milestone Date	Milestone Dates As Shown in FY 1979 Submission
Begin Systems Engineering Test Bed Design System Integration and Advanced Development (AD)	October 1979	Not Applicable
Test Bed Initial Operational Capability (IOC)	Mid FY 1980	Not Applicable
Test Intradivision Weapons and C^2	Complete early FY 1981	Not Applicable
Initiate Engineering Development (ED)	1st Qtr FY 1981	Not Applicable
Augment Test Bed for Corps/Theatre Weapons Systems	Mid FY 1981	Not Applicable
Initiate Development Test/Operational Test	3rd Qtr FY 1982	Not Applicable
Initiate Procurement	3rd Qtr FY 1982	Not Applicable
Complete ED and Total Procurement	Mid FY 1983	Not Applicable
Test Corp/Theatre NATO Integration and AD Weapon Systems and C^2	Complete early FY 1985	Not Applicable

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	0	500	500	Continuing	Not Applicable

Program Element: #6.37.40.A

Title: Short Range Air Defense Command and Control (SHORAD-C^2) Systems

DoD Missions Area: #414 - Field Army Air Defense

Budget Activity: #4 - Tactical Programs

Increased funding in FY 1980 is based on the Army's decision to accelerate development of the SHORAD-C^2 system which is urgently required to replace existing deficient manual system in FY 1983 time frame. The Army anticipates approval of the Letter of Agreement (LOA) in sufficient time to begin advanced development in early FY 1979 and complete engineering development in Mid FY 1983. Specific funding levels to support the SHORAD-C^2 will be determined upon receipt and evaluation of the validated requirement.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Funds (current requirements)					68000	68000
Funds (as shown in FY 1979 submission)					68000	68000
Quantities (current requirements)					16	16
Quantities (as shown in FY 1979 submission)						

5 SHORAD-C^2 Systems for Army Europe Environment
11 SHORAD-C^2 Systems for CONUS Non-Europe Environment

FY 1979 submission did not contain estimates for procurement of SHORAD-C^2 systems since determination of Army needs was still under study.

Program Element: #6.37.40.A

Title: Short Range Air Defense Command and Control (SHORAD-C^2) Systems

DoD Mission Area: #414 - Field Army Air Defense

Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In order to fight and win on the battlefield of the 1980's, the division air defense requires an integrated command, and control (C^2) system capable of supporting the Division Commander's tactical plan. This integrated C2 system must: (1) use standard Army battlefield computers and peripheral devices; (2) be supported with adequate logistics and training; (3) be capable of user operation in all conditions of combat; modular expansion to accommodate changes in the air defense family of weapons, sensors and control facilities, plug-in/out programing; transmission and receipt of preformatted or free text data and control orders; and data processing and display keyed to the functional responsibilities of users at each echelon of the air defense organization; (4) have an integrated data/voice communications system capable of supporting user needs; and (5) be interoperable, to maximum extent feasible, with other Army battlefield functional systems and with other service and allied air control/air defense systems. The SHORAD-C^2 system includes command post facilities at Division Air Defense Artillery (DIVAD), the Division Airspace Management Element (DAME), Short Range Air Defense (SHORAD) battalions, batteries, and platoons, and Man-Portable Air Defense (MANPAD) sections. It also includes the necessary communications and data terminals to interface with weapons, sensors and other Army battlefield functional systems such as division intelligence, division C^2 (non-Air Defense Artillery (ADA)), other ADA forces within the corps, air/ground, electronic warfare, maneuver, personnel and administration and logistics. The SHORAD-C^2 system interfaces with joint service air defense systems through the echelons above division ADA C^2 system (HIMAD (high-to-medium air defense) group and battalion), and may interface directly with Air Force forward air control posts (FACP). SHORAD-C^2 system configuration will vary as new concepts and equipment capabilities evolve. Sensor integration will consider the role of FAAR, onboard radars of new DIVAD weapons, use of passive and active sensors, as well as inputs from sensors external to the division. The time-critical nature of the air battle dictates automation of information processing functions and reliable data communications nets to disseminate critical data. Communications technology, such as time-division, multiple-access (TDMA), suggest performance enhancements that must be confirmed. Human interaction devices for data display and system interface will provide the means for each component of divisional air defense to perform to its designed capability level. The C^2 system will improve the effectiveness of the DIVAD by integrating weapons, sensors, and command posts into a single functional system thereby enhancing the combat power of the weapons, conserving resources, and reducing the risk to friendly aircraft.

G. RELATED ACTIVITIES: P.E. 6.47.79.A, Joint Interoperability Tactical Command and Control Systems (JINTACCS) (Army).

H. WORK PERFORMED BY: Systems Engineering and Integration management is performed by Center for Systems Engineering and Integration (CENSEI), US Army Communications Research and Development Command (CORADCOM), Fort Monmouth, NJ. Contracted efforts are to be performed by two contractors to be selected.

Program Element: #6.37.40.A

Title: Short Range Air Defense Command and Control (SHORAD-C^2) Systems

DoD Mission Area: #414 - Field Army Air Defense

Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: CORADCOM and the US Army Air Defense School (USAADS) coordinated a study titled "Division Air Defense Command and Control Analysis." Examined were reaction time vs weapon effectiveness under different levels of command, control, and communications (C^3): cost of C^3 vs cost of weapons systems or aircraft; and potential test bed equipments and configurations. The results of the overall study were that operational effectiveness reaction time, kill ratio, and better identification can be accomplished with the institution of automated command and control. CORADCOM and USAADS studies and field have demonstrated that this results in an increased relative effectiveness of SHORAD air defense force by a factor of 2 to 4. The combat developer (USAADS) and CORADCOM jointly developed a Letter of Agreement (LOA) for the establishment of an operational test bed facility and development of a SHORAD-C^2 system. The "Combat Development Study Plan: Army Air Defense Command and Control (AAD-C^2); Part I: Division Air Defense Command and Control (DAD-C^2)" in combination with the results of the operational test bed facility experiments, will be the basis for the SHORAD-C^2 objective system. The in-house approach to the program is to define and establish an operational test/bed experimentation facility exploiting existing off-the-shelf Army Tactical Data Systems (ARTADS) and ARTADS-type equipment, such as: The Tactical Computer Systems (TCS) being used in the TOS and the Digital Message Devices (DMD) used in the TACFIRE, will be examined as potential candidates in the divisional air defense command, control, and communications system. Communications developments and technologies (SINCGARS, Packet Radio, and other Tactical Information Distribution Systems) will be examined as the integral communications media. Compatibility and Interoperability requirements for ongoing air defense weapons (STINGER, ROLAND, and the new Divisional Air Defense Gun) will also be defined. Efforts in this area will result in minimum perturbations in dollars and retrofit modifications to these programs at a later date.

2. FY 1979 Program: Funding will be used to award competitive contracts for the design of a test bed and experimentation station to determine the operational and organization requirements for the SHORAD-C^2s. Begin Advanced Development and the systems engineering test bed design, to provide a SHORAD-C^2s (Integrated Automated System) that is based on exploitation of existing tactical hardware, mostly new software and minimal product improvements to the weapons systems. The software will be developed based on existing tactical computers and micro-processors integrated into the tactical systems.

3. FY 1980 Planned Program: $200K is to cover internal manpower efforts such as technical management and ILS support at CORADCOM. $600K is to cover contract support systems engineering of the test bed facility, developing the test plans and test scenarios, evaluation of candidate equipments, evaluation of communication technologies, and identification/documentation of initial division level system compatibility and interoperability requirements with each weapons system in inventory and in development (REDEYE/STINGER, CHAPPARAL/ROLAND, VULCAN/DIVAD-GUN) and AD radars (FAAR and EAD AD) and other division systems. $2200K will be utilized to initiate procurement action for selected test bed equipments and experimental models of appropriate modifications. A functional test facility will be established to validate and demonstrate the technical feasibility of providing a command and control capability to the division air defense units. Existing air defense and data system components along with limited breadboard models of specifically tailored devices will be employed as the basis for synthesizing viable equipment, configuration, operational

employment relationships and interoperability for effective SHORAD-C^2. Compatability and interoperability requirements will be established for other ongoing air defense weapon and sensor systems. Communications equipments and technologies will be evaluated and incorporated into the definitions of the SHORAD-C^2 system. System specifications for the SHORAD command, control, and communications (C3) system will be generated, preparatory to commencement of an engineering development effort. Interoperability with NATO will be assured through the Joint Standardization Group and NATO standardization panels.

4. FY 1981 Planned Program: The jointly developed Outline Development Plan (ODP), LOA, and SHORAD-C^2 study plan will provide the required details for a Concept Formulation Package (CFP) completed by the contractor. The plan will consider procedural, doctrinal and organizational changes, modifications to existing equipment or procurement of new equipment, and training implications. The CEP will contain a trade-off analysis (TOA), Best Technical Approach (BTA), and a Cost and Operational Effectiveness Analysis (COEA). Continue to test intradivision weapons and the SHORAD-C^2 system. Initiate a plan for Engineering Development and the development of training and support requirements for the SHORAD-C^2 system. Augment test bed for Corps/Theatre Weapons Systems. Integrated logistics support is available for existing hardware, hence requires only update for application to the SHORAD-C^2 system.

5. Program to Completion: Complete procurement of equipment for test bed/experimentation facility and conduct experimentation. Develop system material need documentation and refine system modifications as a result of test/experimentation results. Complete Request For Proposal (RFP) and proposal evaluation for an engineering development (ED) prototype SHORAD-C^2 system. Develop total capability in test bed to evaluate integration with all other division systems (aircraft management, TOS, artillery, intelligence), with corps/theater Advanced Development (AD) systems (US and NATO HAWK, NADGE, GEADGE, PATRIOT, AWACS, PLRS, etc.), to be completed in FY85.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.45.A
Title: Tactical Electronic Warfare Equipment
DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3)
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT					Continuing	Not Applicable
	Quantities						Not Applicable
D905	Tactical Electronic Support Measure Systems					Continuing	Not Applicable
D907	Tactical Electronic Surveillance Systems					Continuing	Not Applicable
D925	Tactical Electronic Warfare and Intelligence Command and Control Systems					Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: In order to survive on the modern battlefield, any Army must depend on timely information, rapid decisions and swift communications for success due to the greatly accelerated pace and violence of ground warfare. These functions therefore become important points of vulnerability and are targets of high value for destruction, disruption, exploitation and deception. The US Army is currently ill-equipped to destroy, disrupt, exploit or deceive an opposing commander's command and control means. The Army's tactical electronic warfare equipment, where it exists at all, is antiquated, unreliable and unsupportable on the battlefield in the large majority of cases. The long range goal of the Army is to overcome this major deficiency in the balance of its combat forces by providing the means to rapidly exploit vulnerabilities inherent in an enemy's electronic-dependent systems, to negate his command and control, and to provide tactical systems which, by exploiting technical superiority, will serve as force multipliers to assist in offsetting enemy numerical and firepower superiority.

Program Element: #6.37.45.A
DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3)

Title: Tactical Electronic Warfare Equipment
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: Continue investigation.

Continue development of an All-Source Analysis System and Tactical Electronic Surveillance System.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)				Continuing	Not Applicable

Project D251 now carried in PE 6.37.55.A was carried in PE 6.37.45.A in 1978. For purpose of clarity it has been shown in PE 6.37.55.A in all years in this submission. Increase of $2739K in FY 1978 is due to realignment of funds within this program element which decreased Project D251 and increased Project D925 and also $939K reprograming into Project D925 from another program element so as to reorient this Project towards development of an All-Source Analysis System. Decrease of $3985K in FY 1980 results from funding constraints, which preclude desired efforts and also from a reduced funding requirement for the All-Source Analysis System due to program restructuring.

E. OTHER APPROPRIATION FUNDS: ($ in thousands) Not Applicable.

Program Element: #6.37.45.A
DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3)

Title: Tactical Electronic Warfare Equipment
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to establish the technical feasibility and military potential of tactical electronic support measures (ESM) equipment, tactical electronic surveillance systems and tactical electronic warfare intelligence (EWI) command and control systems. This program includes the development of equipment and systems to detect, collect, and locate enemy infrared and optical emitters and battlefield surveillance devices and to provide electronic order of battle information. Equipment developed includes ground-vehicular and airborne mounted systems. All items in this program are Non-Signal Intelligence/Intelligence-Related Activities (IRA). Non-IRA systems (jammers) were transferred to Program Element (PE) 6.37.55.A, Tactical Electronic Countermeasures Systems, and SIGINT items were transferred to National Security Agency (NSA) PE 3.10.11.G, Cryptologic Activities, in FY 1979.

G. RELATED ACTIVITIES: Related developments are conducted by the Air Force, Navy, and NSA. Coordination is effected between the Services to maximize the interchange of technical data and minimize duplication of effort. Coordination is effected by the exchange of technical reports, attendance at scientific meetings and conferences, joint participation on subgroups and working panels of the Technical Cooperation Program, and by the Joint Tri-Service Electronic Warfare Panel. In addition, formal requirements documents of each Service are exchanged, reviewed, and commented upon by the other Services. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Under Secretary for Research and Engineering). Following Air Force/Navy/NSA PEs apply: 2.56.74.N, Electronic Countermeasures Response; 6.42.55.N, Electronic Support Measures Equipment; 6.37.97.N, Surface Electro-Optic Systems; 6.47.10.F, Reconnaissance Electronic Warfare Equipment; 6.37.43.F, Electro-Optic Warfare, and 3.10.11.G, Cryptologic Activities.

H. WORK PERFORMED BY: US Army Electronic Warfare Laboratory, Fort Monmouth, NJ; the US Army Signals Warfare Laboratory, Vint Hill Farms, Warrenton, VA; US Army Materiel Development and Readiness Command, Alexandria, VA. The major contractors are: GTE Sylvania, Mountain View, CA; TRW, Incorporated, Redondo Beach, CA; and RCA Corporation, Burlington, MA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Prior to FY 1978, efforts currently in this project were found in Program Element (PE) 6.47.11.A, D905, General Support Electronic Warfare Systems. Developments included Technical Electronic Support Measures System (TECH ESM), Single Channel Collection System - Rear (SCCS-R), (AGTELIS); Tactical Control and Analysis Center (CAC), (TACELIS), (TACJAM), Multiple Target Electronic Warfare System (MULTEWS), both

ground-mounted and airborne versions, and other systems. In FY 1978, Program Element (PE) 6.47.11.A was changed to PE 6.37.45.A, Projects D905 (Division Tactical Electronic Warfare (EW) Systems), and D925 (Corps Tactical EW Systems) for FY 1978. The AGTELIS system and associated funding were transferred for management, as an Intelligence Related Activity (IRA). In FY 1978, the development of control and processing systems was funded in Program Element 6.47.45.A, Tactical Electronic Warfare Systems,

Development is now scheduled to continue/

2. FY 1979 Program: An All-Source Analysis System (ASAS) corps level module prototype will be developed. This module is the Advanced Development portion of an All-Source Analysis System (ASAS) currently programed The ASAS is a control and processing system, receiving input from other systems and providing information to the tactical commander. Development of Tactical Electronic Surveillance Systems will continue. development is scheduled to continue

3. FY 1980 Planned Program: Development of ASAS hardware and software System will continue. Development of Tactical Electronic Surveillance

4. FY 1981 Planned Program:

of Tactical Electronic Surveillance Systems will continue. Development

5. Program to Completion: This is a continuing program. Development under this project will normally be transferred to engineering development, Program Element, 6.47.45.A, Tactical Electronic Warfare Systems.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D907 — Title: Tactical Electronic Surveillance System
Program Element: #6.37.45.A — Title: Tactical Electronic Warfare Equipment
DoD Mission Area: #445 - Electronic Warfare/Counter Command, Control and Communications (C^3) — Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: This program supports the Army's Tactical Exploitation of National Capabilities (TENCAP) program advanced development (AD) work which is directed toward developing a tactical support system to collect, process, and disseminate electronic intelligence/information which locates and identifies enemy units, activity, and targets representing a general tactical threat. Data originating from a variety of and tactical electronic surveillance sensors must be transmitted to central collection points where the data can be processed and analyzed. The resulting tactical intelligence must then be rapidly disseminated and fuzed into the command and control environment in such a timely and useful form so as to materially influence the land battle. Techniques and equipment which provide for this rapid collection, transmission, and manipulation of intelligence data is being developed under this program.

B. RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link technologies, tactical identification and positioning, and data reduction/filtering. The potential of satellite communications is being considered. This work is coordinated with the appropriate offices at the level to avoid duplication of effort.

C. WORK PERFORMED BY: Aerospace Corporation, El Segundo, CA; Electromagnetic Systems Laboratories, Sunnyvale, CA; US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; US Army Communications Research and Development Command, Fort Monmouth, NJ.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Studies were completed which provide the technical basis for the equipment, techniques, systems development and interface definition with three systems. Advanced development work was initiated on one electronic surveillance system to render it more responsive to tactical commanders needs.

2. FY 1979 Program: Complete system design for interface with two electronic surveillance systems. Begin installation of interface hardware. Initiate system design studies for interface with two communications intelligence systems and continue advanced development work to improve tactical utility of one electronic surveillance system.

Project: #D907 — Title: Tactical Electronic Surveillance System
Program Element: #6.37.45.A — Title: Tactical Electronic Warfare Equipment
DoD Mission Area: #445 - Electronic Warfare/Counter Command, Control and Communications (C^3) — Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Complete installation of hardware interface with one electronic surveillance system and commence initial testing. Continue Advanced Development (AD) of interface with second electronic surveillance system. Continue AD work to improve tactical utility of one electronic surveillance system. Initiate advanced development of hardware/software interface to allow the Interim Tactical Elint Processor (ITEP) to operate with a new electronic surveillance system. Complete advanced design work on interfaces with two communications intelligence systems and commence initial system modifications.

4. FY 1981 Planned Program: Complete AD to improve tactical utility of one system which was begun in FY79. Complete advanced design work to allow the ITEP to operate with a new electronic surveillance system. Continue with AD of interface with communications intelligence system.

5. Program to Completion: This is a continuing program.

6. Major Milestones: Not applicable.

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	-	-	-	-	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	-	-	-	Not Applicable	Continuing	Not Applicable

Explanation of differences between 1980 and 1979 budget requests: The FY 1979 appropriation was $5.7M less than that requested to fund this portion of the TENCAP program. Congressional language directed that this deficit be apportioned between Program Elements 6.37.30 (D560) and 6.37.45 (D907) at the discretion of the Program Manager. Accordingly, the FY 1979 funding level of this program element was reduced by $2.5M. The increase in FY 1980 resources reflects work which was deferred from FY 1979 because of the shortfall in resources.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio System (SINCGARS)

DoD Mission Area: #443 - Tactical Communications

Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	8026	12721	18501	14190	33450	87258
D555	Single Channel Ground and Airborne Radio System (SINCGARS)	8026	12721	18501	14190	33450	87258

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program covers the development of the major system, SINCGARS-V, and selected ancillary devices. The V represents the Very High Frequency (VHF) portion of the frequency spectrum. SINCGARS-V is the future combat net radio, (push-to-talk netted operations) replacing the current VRC-12 series, and is the primary means of communication for armor, artillery and infantry forces. It is used primarily from brigade down to platoon. Configurations consist of manpack, vehicular and aircraft. Larger and less mobile radios capable of multi-channel (12, 24, etc.) through multiplexing equipment are not covered under this element. The Army's need is based upon more than the requirement to replace the aging VRC-12 family. SINCGARS-V will satisfy the need for a tactical radio system to operate in an electronic warfare environment. The electronic counter-countermeasure (ECCM) technique being validated is frequency hopping. One hopping scheme (slow frequency hopping - SFH) is contained within 25 kHz channel spacing and the other (fast frequency hopping - FFH) is outside 25 kHz channel spacing.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue monitoring performance of three (3) competitive prototyping contractors. Initiate Developmental Testing I (DT I). Continue incremental funding of the three contractors. Contracts will be placed for transducer models to support the SINCGARS-V Testing. Proposals will be evaluated and a contract awarded for Advanced Development models of the new intercom system. Work on the transducers and intercom system were previously conducted under Program Element 6.37.07.A, Project D437.

Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio System (SINCGARS)

DoD Mission Area: #443 - Tactical Communications

Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Advanced Development (AD) Contract Award	April 1978	Not Applicable as no milestone dates were listed in FY 1979 Congressional Descriptive Summary
Development Test/Operational Test I (DT/OT I) Completed	August 1981	
Army Science Annual Review Council/Defense Science Annual Review Council (ASARC/DSARC) II	October 1981	
Engineering Development	November 1981	
DT/OT II Completed	December 1983	
ASARC/DSARC III	April 1984	

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE Funds (as shown in FY 1979 submission)	8151	12721	22280	36819	87098

Germany, the Netherlands, and the United Kingdom were visited to discuss offering a candidate radio system for evaluation. The Netherlands and the United Kingdom advised they were not interested. The Germans expressed an interest only in participating in the electronic counter-countermeasure (ECCM) portion of the program. Therefore, funding for FY80 was adjusted accordingly.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio System (SINCGARS)

DoD Mission Area: #443 - Tactical Communications

Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to develop a new family of combat net radios (manpack, vehicular, and aircraft configurations) and selected ancillary devices. The radio has the following key development goals: (1) modularity with maximum commonality of components and the various configurations; (2) capable of operating with add-on Communications Security (COMSEC) and electronic counter-countermeasures (ECCM) modules; (3) interoperable with combat net radios of our NATO allies; (4) capable of operating in a nuclear environment (Defense Nuclear Agency participation). There is extensive participation in the program by the Air Force, Navy, and Marine Corps. SINCGARS-V is being designed to either replace Air Force, Navy, and Marine Corps close air support Very High Frequency (VHF) radios or to be interoperable with them. The system will be capable of operating with or without COMSEC; with or without ECCM or as a total system in all modes. It will transmit voice, tactical data and record traffic to include teletype and facsimile. To insure a total systems approach on critical ancillary devices, the following developments are under this program:

1. Vehicular Intercom System - This is the intercom system of the future to replace the antiquated AN/VIC-I. Techniques and objectives being explored are: (a) Improve operational functions and capabilities; (b) Improve reliability and durability; (c) Improve installation and maintenance; and (d) Improve COMSEC.

2. Transducers - New transducers are being developed that will increase intelligibility at reduced volumes to overcome hearing losses. The two basic approaches are to: (a) Reduce background noise by employing filtering and directivity, and (b) to expand the audio bandwidth.

G. RELATED ACTIVITIES: Program Element 6.27.01.A, Communications Electronics, Program Element 6.37.07.A, Communications Development, and Program Element 6.47.01.A, Communications Engineering Development, provide exploratory, advanced and engineering developments of related and supporting single channel net radio equipment.

H. WORK PERFORMED BY: Contractors are Cincinatti Electronics Corp., Cincinatti, OH, ITT Aeronautical/Optical Division, Ft Wayne, IN, and Collins Telecommunications Product Division, Rockwell International, Cedar Rapids, IA. In-house developing organization is the US Army Communications Research and Development Command (CORADCOM), Ft Monmouth, NJ. National Security Agency (NSA) is responsible for development of the COMSEC module (VANDAL).

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Three (3) Advanced Development contracts to design, develop, fabricate and test forty-three (43) pieces of hardware per contractor were awarded in April 1978. Cincinatti Electronics (A British company is subcontractor) and ITT for the so-called slow frequency hopping (SFH) system and Collins Radio for the so-called fast frequency hopping (FFH) system. Germany, the Netherlands and the United Kingdom were visited during 1977-78 to discuss Memorandums of Understanding (MOU's) on their participation in the program by offering a candidate radio system for evaluation. The Netherlands

and the United Kingdom advised they are not interested. The Germans, however, have expressed an interest in participating in the electronic counter-countermeasure (ECCM) portion of the program. This action is being worked by the Office of the Secretary of Defense (OSD) (Communications, Command, Control and Intelligence (C^3I)). Continuous coordination is maintained in NATO working groups to insure the achievement of standards. NATO has been requested to provide representation to two Program Manager (PM) SINCGARS advisory groups in order that they may be kept abreast of all development activities.

2. FY 1979 Program: Performance of the three (3) contractors will be monitored. Continue coordination with the National Security Agency on application of the VANDAL communication security system to the SINCGARS system. Results of an Electromagnetic Compatability/Vulnerability Analysis for frequency hopping radios will be applied to the contractual effort. Provide incremental funding of contracts. The required radio/intercom interface will be determined and a specification provided to the SINCGARS-V radio contractors. Models of the new transducers will undergo contractor and government tests to insure that environmental and Electromagnetic Interferance (EMI) standards are met.

3. FY 1980 Planned Program: Continue monitoring performance of the three (3) contractors. Provide engineering support, continue incremental funding of contracts, and initiate factory Developmental Testing I (DT I). Proposals will be evaluated and a contract award for development models of the new intercom system is planned. The feasibility models of the new transducers will be provided to the intercom and SINCGARS-V contractors for interface compatability design and testing. Contracts will be placed for sufficient transducer models to support the SINCGARS-V Testing Program.

4. FY 1981 Planned Program: Continue monitoring contractor's performance. Complete DT I and start and complete Operational Testing I (OT I) on SINCGARS-V. Prepare Requests for Proposals (RFP) for next phase of program. Provide engineering support. The development models of the new itercom will be delivered for DT/OT I. Concurrent testing with the SINCGARS-V radio will be accomplished to measure compatability.

5. Program to Completion: Completion of contracts for SINCGARS-V during FY82. Defense System Acquisition Review Council II (DSARC II) will be held during FY82 to approve decision on next phase of the SINCGARS-V program.

Program Element: #6.37.46.A
DoD Mission Area: #443 - Tactical Communications

Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Cincinnati Electronics, Cincinnati, OH; Rockwell/Collins, Cedar Rapids, IA; and International Telephone and Telegraph, Fort Wayne, IN, are the development contractors for this program.

b. All testing for this program is in the planning stage. A Coordinated Test Plan (CTP) for the first phase of testing has been prepared. The CTP displays the test schedule through August 1981. Development Testing (DT) will begin with DT I in January 1981 and the critical issues will be addressed in all testing. Three contractors will participate through DT I to keep costs of development and procurement as low as possible. DT II is scheduled to begin June 1983 and DT III in December 1984. Reliability, availability, and maintainability (RAM) data will be collected throughout development testing.

2. Operational Test and Evaluation: Testing is in planning stage. Operational Testing (OT) planned and executed by the US Army Operational Test Evaluation Agency (OTEA) will begin with OT I in April 1981. Testing will concentrate on obtaining data for subsequent evaluations of the functional performance of each of the SINCGARS-V configurations and overall effectiveness of the SINCGARS-V concepts. Typical user troops will operate the equipment and OTEA will determine the mission reliability. The selected contractors will perform the maintenance. Concepts and interoperability with other tactical communication systems will be assessed. OT II is scheduled to be conducted 1st Qtr 1983. Test sites have not been determined, but tests will be conducted where an operational division and maneuver area are available.

3. System Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance 1/
Advanced Radio Systems Developments		
Optimum Very High Frequency-Frequency Modulation digital transmission at 16 Kilobits/ per second between 30-88 Mega Hertz	25 Kilo Hertz	
Available channels	2400	

Program Element: #6.37.46.A
DoD Mission Area: #443 - Tactical Communications

Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)
Budget Activity: #4 - Tactical Programs

Operational/Technical Characteristics	Objective	Demonstrated Performance 1/
Manpack Configuration		
Size (cu in) complete system	250	
Weight (lbs) including security device and Electronic Counter Counter Measures (ECCM) modules	20	
Weight (lbs) without Communications Security (COMSEC) device	17	
System Reliability (MTBF-hours) (without COMSEC and Electronic Counter Counter Measure Modules)	1300 (manpack) 1250 (vehicular) 750 (aircraft)	

1/ No testing performed to date.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.55.A — Title: Tactical Electronic Countermeasures Systems
DoD Mission Area: #445 - Electronic Warfare/Counter Command, Control, and Communications (C^3) — Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT					Continuing	Not Applicable
DK12	Division Tactical Electronic Countermeasures Systems					Continuing	Not Applicable
DK13	Corps Tactical Electronic Countermeasures Systems					Continuing	Not Applicable
D251	Protective Electronic Warfare Equipment					Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is to provide for validation/advanced development of tactical electronic countermeasures (ECM) equipment and systems to assist the Brigade, Division, and Corps commander in denying, destroying, disrupting and deceiving hostile command and control communications and radars associated with weapons systems, maneuver forces and other threats of immediate value to the commander. Overcoming current equipment deficiencies is of prime importance to the Army tactical commander. This program provides for the orderly future development of systems to counter a changing threat and to replace systems now fielded and provides for tactical systems which, by exploiting technical superiority, will serve as force multipliers to assist in offsetting WARSAW PACT numerical, mobility and firepower superiority. A complementary mix of airborne and high-survivability ground assemblies will provide 24-hour, all-weather, coverage in-depth.

C. BASIS FOR FY 1980 RDTE REQUEST: FY 1980 funds are required to support: development of automatic test equipment applications software for the AN/MLQ-34 Tactical Ground-based Communications Jammer, (TACJAM) and the heliborne AN/ALQ-151 very-high-frequency jammer (QUICK FIX), to allow for intermediate maintenance to be performed at common automatic test system facilities; system validation leading toward the development of a family of very rugged and rapidly erectable antenna systems for use with communications and non-communications jammers; and continuation of advanced development of a family of expendable communications jammers.

Program Element: #6.37.55.A
DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3)

Title: Tactical Electronic Countermeasures Systems
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)				Continuing	Not Applicable

Decrease of $1406K in FY 1980 is due to budgetary constraints, which preclude funding of desired efforts in Project D251.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:*						
Funds (current requirements)	0	22400	21400			
Funds (as shown in FY 1979 submission)	0	22400	21400			
Quantities (current requirements)	0	10	10			
Quantities (as shown in FY 1979 submission)	0	10	10			

* Funds/quantities shown are for AN/MLQ-34 (TACJAM). Note that listing of procurement funding in FY 1979 Descriptive Summary for Program Element 6.37.55.A, through administrative error, did not agree with TACJAM procurement actually requested; above reflects what was actually requested and shows no change in estimated cost as well as increased quantity due to inclusion of FY 1984 estimate in FY 1980 Descriptive Summary.

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems

DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3) Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement, Army:**						
Funds (current requirements)	11800	300	33400			
Funds (as shown in FY 1979 submission)	11800	300	25900			
Quantities (current requirements)	5	0	5			
Quantities (as shown in FY 1979 submission)	5	0	5			

** Funds/quantities shown are for AN/ALQ-151 (QUICK FIX). Difference reflects decision to reconfigure this system from its current EH-1H helicopter to an EH-60 (BLACK HAWK) vehicle. Conversion effort begins in FY 1980 and added cost reflects purchase of EH-60 aircraft. Note that listing of procurement funding in *FY 1979 Descriptive Summary for Program Element* 6.37.55.A, through administrative error, did not agree with QUICK FIX procurement actually requested; above reflects what was actually requested.

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DoD Mission Area: #445 - Electronic Warfare Counter Command, Control, and Communications (C^3) Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to provide for validation/advanced development of electronic countermeasures (ECM) equipment and systems to deny or degrade the enemy's use of his electromagnetic communications and radar devices. This program includes the development of ECM equipment

Equipment developed includes ground-vehicular mounted and airborne ECM systems. Developments include airborne Multiple Target Electronic Warfare System (MULTEWS) radar jammer; Close Air Support Communications Jammer; Heliborne Communications Jamming System (QUICK FIX); Tactical Army Communications Jammer (TACJAM); quick erectable antenna mast assemblies; automated test equipment software development for all systems; expendable jammers, both artillery-launched and for installation in remotely piloted vehicles (RPV); warning devices as self-protection measures for tactical vehicles and installations; and countermeasures

Systems developed in this program element normally proceed to Program Element 6.47.50.A, Tactical Electronic Countermeasures Systems, for full scale development.

G. RELATED ACTIVITIES: Related electronic warfare developments are conducted by the Air Force and Navy. Air Force developments are conducted in Program Elements 6.37.18.F, Electronic Warfare Technology, and 6.37.43.F, Electro-Optic Warfare. Navy developments are found in Program Elements 2.57.64.N, Electronic Warfare Countermeasures Response; 6.35.21.N, Surface Electronic Warfare; and 6.37.97.N, Surface Electromagnetic and Optical Systems. Coordination is maintained between the Services to maximize the interchange of technical data and minimize duplication of effort. Coordination is accomplished by the exchange of technical reports, attendance at scientific meetings and conferences, joint participation on subgroups and working panels of the Technical Cooperation Program, and by the Joint Tri-Service Electronic Warfare Panel. In addition, formal requirements documents of each Service are exchanged and reviewed by the other Services. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Under Secretary for Defense Research and Engineering).

H. WORK PERFORMED BY: US Army Electronic Warfare Laboratory, Fort Monmouth, NJ; the US Army Signal Warfare Laboratory, Vint Hill Farms Station, Warrenton, VA; US Army Materiel Development and Readiness Command, Alexandria, VA. The major contractors are: ESL Incorporated, Sunnyvale, CA; GTE Sylvania, Mountain View, CA; Cincinnati Electronics, Cincinnati, OH; RCA Corporation, Camden, NJ; Texas Instruments, Dallas TX; ITT Corporation, Nutley, NJ; ITT Research Institute, Chicago, IL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1973 and Prior Accomplishments: Studied techniques for degrading the guidance levels of enemy anti-tank guided missile (ATGM). Conducted technical evaluation of counterbattery radar expendable jammers. Two competing anti-tank guided missile (ATGM) electronic countermeasures (ECM) were field tested. Advanced development was completed and military potential demonstrated for the following systems: The AN/ALQ-143 Multiple Target Electronic Warfare System (MULTEWS) radar jammer,

the AN/MLQ-33 Close Air Support Communications Jammer (CAS ECM), and the AN/ALQ-151 Heliborne Communications Jamming System (QUICK FIX). In addition, a program to optimize the communications was completed. Development and Operational testing of AN/MLQ-34, Tactical Army Communications Jammer (TACJAM), was completed. Procurement of applications software for the AN/MLQ-34 and AN/ALQ-151 (QUICK FIX) to allow for intermediate maintenance to be performed at common automatic test system facilities continued. System validation leading toward the development of a family of very rugged and rapidly erectable antenna systems for use with communications and non-communications jammers was begun. The program to develop optimized communications jamming modulations to will continue. System validation for a series of expendable was initiated.

2. FY 1979 Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for the AN/MLQ-34 Tactical Ground Based Communications Jammer (TACJAM) and the AN/ALQ-151 Heliborne Very-High-Frequency Jammer System, (QUICK FIX) to allow for intermediate maintenance to be performed at common automatic test system facilities will continue. System validation leading toward the development of a family of very rugged and rapidly erectable antenna systems (tactical antenna masts and assemblies) for use with communications and non-communications jammers will continue. A program to optimize communications will be completed and the results applied to deployed and developmental communications jammers. Advanced development, will continue.

3. FY 1980 Planned Program: Efforts initiated in prior years will continue. Automatic test equipment (ATE) applications software for the AN/MLQ-34 and AN/ALQ-151 will continue. Development of the tactical antenna masts and assemblies will continue. Development will be continued and development testing will be initiated. Development of will continue. Development of an will begin.

4. FY 1981 Planned Program: Efforts initiated in prior years will continue. Advanced development will be initiated. Prototype development of a system will be investigated. Automatic test equipment applications software for the AN/MLQ-34 and AN/ALQ-151 will be completed. Development of tactical antenna masts and assemblies, the Air Defense Electronic Warfare System, will continue.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DK12 Title: Division Tactical Electronic Countermeasures Systems
Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DoD Mission Area: #445 - Electronic Warfare/Counter C^3 Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is to establish the technical feasibility and military potential of tactical electronic countermeasures (ECM) equipment and systems to assist the Brigade and Division commander in denying, destroying, disrupting and deceiving hostile command and control communications and radars associated with weapons systems, maneuver forces and other threats of immediate value to the commander. Overcoming current equipment deficiencies

is of prime importance to the Army tactical commander. This project provides for the orderly future development of systems to counter a changing threat and to replace systems now fielded and provides for tactical systems which, by exploiting technical superiority, will serve as force multipliers to assist in offsetting WARSAW PACT numerical, mobility and firepower superiority. A complementary mix of airborne and high-survivability ground assemblies will provide twenty-four hour, all-weather, coverage in-depth.

B. RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link technologies, and tactical identification and positioning.

C. WORK PERFORMED BY: Major contractors are Analytics Inc., Willow Grove, PA; GTE Sylvania, Mountain View, CA; ESL Incorporated, Sunnyvale, CA; Quest Research, McLean, VA; Cincinnati Electronics, Cincinnati, OH. In-house development and contract monitoring is accomplished by the US Army Signals Warfare Laboratory, Warrenton, VA.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: A heliborne communications jamming system, AN/ARQ-33 (QUICK FIX I), was developed, tested and three Quick Reaction Capability (QRC) models were deployed. A follow-on heliborne communications jamming system, AN/ALQ-151 (QUICK FIX II) was developed, tested and type classified Standard A. Procurement of the AN/ALQ-151 has been initiated. A ground-based tactical communications jammer, AN/MLQ-34 (TACJAM), A program to optimize communications has been initiated. System validation has started.

Project: #DK12 — Title: Division Tactical Electronic Countermeasures Systems
Program Element: #6.37.55.A — Title: Tactical Electronic Countermeasures Systems
DoD Mission Area: #445 - Electronic Warfare/Counter C^3 — Budget Activity: #4 - Tactical Programs

2. FY 1979 Program:]the system will be type classified and procurement initiated. Procurement of applications software to allow intermediate maintenance to be performed at common automatic test system facilities for AN/MLQ-34 and AN/ALQ-151 will continue. The program to develop optimized communications[,will be developed. Prototype development' 'will continue. System validation leading toward the development of a family of very rugged and rapidly erectable (sixty to ninety seconds) antenna systems (tactical antenna masts and assemblies) for use with communications and noncommunications jammers will begin. Use of these antennae will find application in other tactical systems.

3. FY 1980 Planned Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for the AN/MLQ-34, (TACJAM) and the Heliborne Very-High-Frequency Jammer QUICK FIX (AN/ALQ-151) to allow intermediate maintenance to be performed at common automatic test system facilities will continue. The development of a family of very rugged and rapidly erectable antenna systems (Tactical Antenna Masts and Assemblies) for use with communications and non-communications jammers will continue. Advanced development]will continue.

4. FY 1981 Planned Program: Efforts initiated in prior years will continue. Automatic test equipment applications software for the AN/MLQ-34 and AN/ALQ-151 will be completed. Development of the Tactical Antenna Masts and Assemblies will continue. Development ,initiated. Development]will be initiated. Development]will be initiated.

5. Program to Completion: This is a continuing program.

6. Major Milestones:

Task Name	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
AN/ALQ-151, QUICK FIX	Type Classification	1 Qtr FY 1978	Not Shown
AN/MLQ-34, TACJAM	Type Classification		Not Shown

Project: #DK12 — Title: Division Tactical Electronic Countermeasures Systems

Program Element: #6.37.55.A — Title: Tactical Electronic Countermeasures Systems

DoD Mission Area: #445 - Electronic Warfare/Counter C^3 — Budget Activity: #4 - Tactical Programs

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE,A						
Funds (current requirements)	[redacted]				Continuing	Not Applicable
Funds (as shown in FY 1979 submission)					Continuing	Not Applicable
Quantities: Not Applicable						

*Difference between previous and current FY 1980 RDTE estimates is due to acceleration of [redacted]

Other Appropriations:						
Other Procurement, Army**						
Funds (current requirements)	0	22400	21400	[redacted]		
Funds (as shown in FY 1979 submission)	0	22400	21400			
Quantities (current requirements)	0	10	10			
Quantities (as shown in FY 1979 submission)	0	10	10			

**Funds/quantities shown are for AN/MLQ-34. (See Descriptive Summary for Project DK12)

Aircraft Procurement, Army***						
Funds (current requirements)	11800	300	33400	[redacted]		
Funds (as shown in FY 1979 submission)	11800	300	25900			

Project: #DK12
Program Element: #6.37.55.A
DoD Mission Area: #445 - Electronic Warfare/Counter C^3

Title: Division Tactical Electronic Countermeasures Systems
Title: Tactical Electronic Countermeasures Systems
Budget Activity: #4 - Tactical Programs

7. Resources ($ in thousands): (Continued)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Quantities (current requirements)	5	0	[			]
Quantities (as shown in FY 1979 submission)	5	0				

*** Funds/quantities shown are for AN/ALQ-151. Difference in funds is due to decision to convert AN/ALQ-151 (QUICK FIX) system from its current (EH-1) platform to the BLACKHAWK (EH-60) helicopter. Funds shown include cost of EH-60 procurement. systems procured in FY 1978 and FY 1980 are mounted in EH-1.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.01.A
Title: Aircraft Avionics
DoD Mission Area: #446 - Navigation, Positioning, and Related
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3651	6359	756	4201	Continuing	Not Applicable
DC95	Airborne Data Links	0	4110	600	200	Continuing	Not Applicable
DC96	Aircraft Navigation & Control Systems	320	1384	0	1785	Continuing	Not Applicable
DC97	Avionics Systems	3331	865	156	2216	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for engineering development leading to production of data link, avionics, and air traffic control equipment. The goal is to provide aircraft subsystems and ground equipment which improve mission performance of tactical helicopters and special mission aircraft operating in the anticipated enemy air defense and electronic warfare environment.

C. BASIS FOR FY 1980 RDTE REQUEST: The FY 1980 request supports continuation of OV-1D MOHAWK data link improvement, and completion of Integrated Avionics Control Systems (IACS) contractual development effort.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
Funds (as shown in FY 1979 submission)	2775	6359	5669	Continuing	Not Applicable

Increase in FY 1978 is due to slight increase in Integrated Avionics Control System (IACS) funding plus provision of funds for development tests of AN/TSW-7 control tower and AN/ASN-128 Doppler navigator. Decrease in FY 1980 due to reduction of funding for Project DC96, Aircraft Navigation and Control Systems and Project DC97, Avionics Systems in order to finance higher priority programs.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.42.01.A Title: Aircraft Avionics
DoD Mission Area: #446 - Navigation, Positioning, and Related Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Project DC95 (Airborne Data Links) is responsive to the OV-1D MOHAWK side looking airborne radar (SLAR), a part of the AN/UPD-2A tactical radar surveillance system. Information received by this radar systems is converted to a digital data format and transmitted to the ground sensor terminal in near real time. Currently the OV-1D uses a data link The purpose of project DC95 is to design and test

Antijam circuit techniques will be incorporated to allow the AN/ARC-164 radio to cope with the threat potential for jamming. Techniques developed will have potential application to other airborne systems Project DC96 (Aircraft Navigation and Control Systems) is directed at the development of tactical navigation, approach and landing, and air traffic control systems to enhance combat and combat support aviation operations. Project DC97 (Avionics Systms) includes the Integrated Avionics Control System (IACS) which will use integrated control panel, microprocessor and data bus multiplexing techniques to achieve significant saving of cockpit space. It is planned to apply IACS to new Army aircraft. Other efforts in this project include system installation and engineering support, and developments in communications accessories and antennas, including radio processing, and ECCM improvements.

G. RELATED ACTIVITIES: In order to avoid unnecessary duplication of effort, related programs of the Air Force, Navy, Federal Aviation Agency, and other organizations are monitored by the Army through committees and working groups. Cost reduction is pursued through joint developments and hardware standardization. This program element is related to program elements 6.22.02.A (Aircraft Avionics Technology) and 6.32.07.A (Aircraft Avionics Equipment).

H. WORK PERFORMED BY: Combat Surveillance and Target Acquisition Laboratory (Project DC95), Project Manager, Navigation and Control Systems (Project DC96), and US Army Avionics Research and Development Activity (Project DC97), Fort Monmouth, NJ. Contractors include: Grumman Aerospace Corporation, Bethpage, NY; Rockwell International Corporation, Cedar Rapids, IA; American Electronic Laboratories, Inc., Colman, PA; and Litton Industries, Woodland Hills, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Completed engineering developments include: the AN/TRN-30 low frequency beacons, the AN/TSQ-97 manportable control facility, the AN/TSW-7A transportable control tower (adaption of Air Force items), the Tactical Landing System (TLS), the AN/ARN-114 Long Range Navigation (LORAN) receiver, the AN/ASN-128 Doppler navigation system, and the

AN/ARC-98 high frequency radio. The AN/TRN-30, AN/TSQ-97, AN/TSQ-7A, and AN/ASN-128 items mentioned above are in production. The Integrated Avionics Control System (IACS) continued in engineering development in FY 1978. AN/ARC-114 and AN/ARC-115 radios have been modified for digital remote control operation in support of the IACS program. Plans were developed for an integrated IACS/Doppler/Projected Map Display system.

2. FY 1979 Program: Start engineering development of improvement of OV-1D MOHAWK AN/UPD-2A radar surveillance system data link. Adapt C-10414( )ARC commercial intercommunication system for Army use, adapt Air Force AN/ARC-186 radio for use, and complete delivery of IACS engineering development models.

3. FY 1980 Planned Program: Continue OV-1D MOHAWK data link improvement in engineering development. Complete IACS contractual development effort.

4. FY 1981 Planned Program: Complete OV-1D MOHAWK data link improvement. Initiate engineering developments for an advanced map display for tactical helicopters, and for a data bus controller to be used as a standard item with digital data buses in new and modernized aircraft. All necessary experimental work will be performed and the proposed system will be ready for full scale development.

5. Program to Completion: This is a continuing program. Complete engineering development of advanced map display and data bus controller and transition to production. In response to user requirements, develop air traffic control hardware to the point of production transition.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.02.A
DoD Mission Area: #413 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	15594	10460	5302	5134	2815	48536
DL62	Aircraft Rocket Subsystems	4972	6808	4202	5134	2815	30199
DL33	Aircraft Gun Type Weapons	10622	3652	1100	0	0	18337

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development and test of aircraft weapon subsystems, excluding missiles. These efforts support the requirement for low cost, reliable, easily maintainable, lightweight, increasingly effective armament subsystems of advanced design for attack helicopters.

C. BASIS FOR FY 1980 RDTE REQUEST: These funds will provide attack helicopters with improved suppressive fire capability at the required standoff ranges. The High Explosive, HEI (XM 799), and High Explosive Dual Purpose, HEDP (XM 789), 30mm rounds, will be type classified. The Lightweight Launcher (LWL) for 2.75 inch rockets will complete development and will be type classified. Development and testing of an improved rocket motor and of the multipurpose submunition warhead with remote set fuze for the 2.75 inch rocket will continue.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE Funds (as shown in FY 1979 submission)	15751	10460	5302	3753	43727

Program review restructured the 2.75" Rocket Development Program based on requirement to improve system effectiveness. Funding profiles in FY 1981/82 were increased $4.2 million to accelerate development of the LWL, rocket motor and three warheads with remote set fuze capability for the AH-IS attack helicopter. This accelerated program will complete development of the lightweight launcher in FY 1979 and of the multipurpose submunition warhead and rocket motor in FY 1981.

Program Element: #6.42.02.A
DoD Mission Area: #413 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements)	0	2276	7100	6100	6000	21476
Funds (as shown in FY 1979 submission)	0	2300	3400	-	54478	60178
Quantities (current requirements in thousands)	0	.8	3.2	5	3	12
Quantities (as shown in FY 1979 submission)	0	3	4	-	122	129

Current lines indicate quantities and funds for 2.75 inch Rocket Lightweight Launchers. FY 1979 figures included all 2.75 inch rocket procurement which is currently funded under Procurement of Ammunition, Army (PAA).

Program Element: #6.42.02.A
DoD Mission Area: #413 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program supports the development of new gun and rocket weapons subsystems for Army Aircraft. The requirement is for reliable, low cost, easily maintainable, minimum drag, lightweight armament subsystems of advanced design that provide sufficient standoff range and effectiveness. Guns (turret and pod mounted) and rockets that have demonstrated feasibility continue development. Fire control and other associated equipment for total subsystem operation will be developed.

G. RELATED ACTIVITIES: Close liaison is maintained with the other military services and industry to avoid duplication of effort. The Army participates in the Tri-Service Joint Technical Coordinating Group for Air-Launched Non-Nuclear Ordnance, an organization chartered at the major field command level. This group provides a medium for exchange of technical information and determination of joint use implications. An Army representative serves on the Air Munitions Requirements and Development Committee, an organization within the Office of the Secretary of Defense. One of the functions of this committee is the establishment of joint service requirements and development of air munitions. Related Program Elements are 6.42.07.A, Advanced Attack Helicopter; 6.42.12.A, COBRA/TOW; 6.32.06.A, Aircraft Weapons; and 6.22.01.A, Aircraft Weapons Technology.

H. WORK PERFORMED BY: Contractors: Hughes Aircraft Company, Canoga Park, CA; Norris Industries, Los Angeles, CA; Hercules Incorporated, Radford, VA; Hi-Line Plastics, Incorporated, Olathe, KS; Cosin Industries, Sheboygan, WI; Hughes Helicopters, Culver City, CA; Honeywell Incorporated, Minneapolis, MN; and seven other contractors or prospective bidders accounting for ($1,765,000) of the effort. In-house organizations: US Army Aviation Research and Development Command, St. Louis, MO; US Army Armament Research and Development Command, Dover, NJ; US Army Missile Research and Development Command, Huntsville, AL; Naval Ordnance Station, Indian Head, MD; Lake City Ammunition Plant, Lake City, MD; Project Manager, Advanced Attack Helicopter, St. Louis, MO.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Developed and standardized: 7.62mm Suppressive Fire Subsystems for the OH-13, OH-23, UH-1B, UH-1C, UH-1D, and CH-47 helicopters; 2.75 inch rocket systems for the UH-1B, UH-1C, and AH-1G helicopters; a first generation hard point target missile system for the UH-1B(M-22); a 40mm grenade launcher system for the UH-1B, UH-1C, and OH-6A; an improved 7.62mm machine gun for all helicopter systems; a super quick fuze for the 2.75 inch rocket and proximity fuze for the 40mm grenade launcher and 2.75 inch rocket; repairable/reusable 2.75 inch rocket launchers; an illuminating flare and dispenser system for utility helicopters; and a fixed range smoke screening warhead for the 2.75 inch rocket. Developed a 30mm automatic gun turret, XM140; 40mm grenade launcher, XM129; an integrated fire control system utilizing moving target indicator radar for long range target detection; TOW missile system on the AH-1G. Completed a Data Acquisition Test (DAT) to acquire data on the performance characteristics and operational parameters of two candidate 30mm cannon systems (XM 188 and XM 230) for the advanced attack helicopter (AAH). Initiated development of: new family of 2.75 inch rocket warheads with remote set fuzing capability; new 2.75 inch rocket lightweight launchers; a training practice, high explosive, and high explosive dual purpose 30mm ammunition, interoperable in the ADEN/DEFA guns, for attack helicopters.

2. FY 1979 Program: The high explosive, HEI, (XM 799) and the high explosive dual purpose, HEDP, (XM 789) 30mm rounds with aluminum case cartridge will complete development and low rate initial production (LRIP) will begin. Delivery of LRIP quantities of the 30mm training practice round (XM 788) will continue. The multipurpose submunition warhead (XM 261) with remote set fuze, and the improved rocket motor for the 2.75 inch rocket will continue development. The 2.75 inch rocket lightweight launcher will complete development and will enter LRIP.

3. FY 1980 Planned Program: The high explosive dual purpose, HEDP, (XM 789) will complete development and planning for transition to full scale production continues. The multipurpose submunition warhead (XM 261), improved rocket motor, and remote set smoke screening warhead continue development.

4. FY 1981 Planned Program: Finalize the technical data package (TDP) for the training practice (XM 788) and the high explosive dual purpose (XM 789) 30mm rounds. Complete transition of these items to single service manager. The development and operational testing of the multipurpose submunition warhead and improved rocket motor for the 2.75 inch rocket will be completed. The remote set illumination warhead will continue development.

5. Program to Completion: The remote set smoke screening and illumination warheads are scheduled to complete development in FY 1983. The 30mm ammunition Product Management Office will be closed in FY 1982.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.03.A — Title: Aerial Scout
DoD Mission Area: #411 - Battlefield Surveillance — Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	5487	12500	55300	To Be Determined	To Be Determined
	Quantities						To Be Determined
D281	Advanced Scout Helicopter (ASH)	0	2987	12500	55300	To Be Determined	To Be Determined
D304	ASH (NATO)	0	2500	0	0	0	2500

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Ground commanders require a dedicated highly survivable aerial scout for the conduct of reconnaissance, surveillance, security, target acquisition, and target designation functions in all intensities and weather conditions of warfare. In performing these functions, the aerial scout will operate in air cavalry, attack helicopter, and field artillery units. The objective of this program is to develop the most cost-effective system to fill this requirement. Providing to front line tactical units an aerial scout which is capable of day and night operation under adverse weather conditions will give the Army a new capability. As an integral part of the Army's combined arms team, the aerial scout will be the focal point for effectively finding the enemy and directing a coordinated attack against his forces. In the antiarmor role, the scout and the AH-64A Advanced Attack Helicopter will operate in close harmony as a hunter/killer team. In support of field artillery the scout will provide conventional artillery spotting and precision laser designation for the COPPERHEAD. Results of previous studies have shown a small, agile, highly maneuverable helicopter, designated the Advanced Scout Helicopter (ASH), to be the preferred system for these roles. The studies planned for completion in FY 1979 will reexamine the alternative systems and the various helicopter options while planning continues for the development and acquisition of the ASH.

C. BASIS FOR FY 1980 RDTE REQUEST: Support source selection activities to evaluate proposals, initiate full-scale engineering development, and provide project management.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Concept Formulation Package Complete	Jul 1979	Nov 1979
Army Systems Acquisition Review Council (ASARC) II	Oct 1979	May 1980
Defense Systems Acquisition Review Council (DSARC) II	Nov 1979	Jun 1980
Request for Proposal (RFP) Release	Dec 1979	Dec 1979
Contract Award	May 1980	Jul 1980

The milestone dates have been accelerated in an attempt to support the Congressionally desired Initial Operational Capability (IOC) of 31 December 1984.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	0	5487	41408	598405	645300

The estimated funding requirement for FY 1980 has been revised based on program structure changes. System selection activities and the determination of the acquisition strategy, both planned for FY 1979, will determine the total estimated costs and may require adjustments in the FY 1981 estimate.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Aircraft Procurement, Army						
Funds (current requirements)	0	0	0	0	To Be Determined	To Be Determined
Funds (as shown in FY 1979 submission)	0	0	0	0	To Be Determined	To Be Determined
Quantities (current requirements)	0	0	0	0	1436	1436
Quantities (as shown in FY 1979 submission)	0	0	0	0	1438	1438

The change in quantities reflects a minor adjustment of replacement factors.

Program Element: #6.42.03.A Title: Aerial Scout
DoD Mission Area: #411 - Battlefield Surveillance Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In January 1974, Headquarters Department of the Army approved a Required Operational Capability (ROC) for an Advanced Scout Helicopter (ASH). A special task force reviewed the need for an aerial scout and conducted concept formulation efforts and trade-off analyses and evaluations during FY 1975. In February 1975, the Army Systems Acquisition Review Council (ASARC) approved the need for the ASH and the initiation of hardware development. This need and initiation of a development program was subsequently approved by the Department of Defense Systems Acquisition Review Council (DSARC) in September 1975. Both the Army and the Department of Defense concluded that some commonality between the ASH and potential future helicopters in the same weight class, such as a light attack or a light utility, was probably achievable. In March 1976, the DSARC again reviewed the Army's program and reaffirmed support for a helicopter in the weight class of ASH and approved development of a Target Acquisition and Designation System (TADS) and Pilot Night Vision System (PNVS) to be common to the ASH and Advanced Attack Helicopter (AAH). Subsequent Congressional action denied the ASH FY 1977 fund request, increased the AAH funds to provide for development of TADS and PNVS, and provided guidance to disestablish the ASH Project Office. Congress indicated, however, that the ASH program would be considered later if proposed by the Army. The requirement continues, and the Army requested FY 1979 funds, which were provided by Congress, to support the analyses and system trade-off studies required to determine the best candidate systems to meet the requirement as it is being updated. A special study group has been established to refine the specifics of the requirement and to thoroughly explore all candidate systems. This work is expected to be completed in August 1979. Advanced planning is oriented toward a small, agile, highly maneuverable helicopter for the aerial scout missions because previous studies and reviews have shown this to be the preferred option. Previous studies are not, however, constraining the current study effort which is considering nonhelicopter as well as helicopter candidates in order to determine the optimum system and mission equipment configuration to accomplish the aerial scout functions in the projected threat environment. New development helicopters and modifications to existing ones, both US and European, are all being considered in the study. At this time, the preferred alternative appears to be the modification of an existing helicopter design. FY 1980 and 1981 fund requests are at a level required to support such a program.

G. RELATED ACTIVITIES: Previous aerial scout program concept and program formulation efforts were conducted under program element 6.32.05.A, Aerial Scout. TADS and PNVS are being developed under program element 6.42.07.A, AAH. The ASH may use the GE T-700 engine which is being used on AAH and Black Hawk, UH-60A, helicopters. An advanced technology engine in the 800 horsepower range is being developed under program element 6.32.02.A may have later application to the ASH. Weapons systems, being developed under program elements 6.46.21.A and 6.43.10.A Heliborne Missile - HELLFIRE, may use the terminal homing guidance provided by the ASH.

H. WORK PERFORMED BY: Contractors will be determined when source selection has been completed in 1980. In-house developing organization: US Army Aviation Research and Development Command, St. Louis, MO.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: A concept formulation effort was undertaken in FY 1973 which included defining the Required Operational Capability (ROC). With Department of the Army approval of the ROC in January 1974, a multicommand Task Force was established to formulate the ASH program. Program formulation efforts continued through FY 1975. During FY 1976, the program

was reviewed and approved for development by the Office of the Secretary of Defense. During FY 1977, the Decision Coordinating Paper (DCP) and Required Operational Capability (ROC) document was updated and submitted for staffing at Department of the Army Headquarters in preparation for DSARC review to provide final program guidance in January 1977. In September 1976, Congressional action deleted all funds for the restructured FY 1977 program with the guidance that the Project Office should be disestablished. The office was disestablished on 30 September 1976. In FY 1978, a special study group was assembled to refine the ROC, develop a concept formulation package and up-date the DCP with a Mission Element Need Statement (MENS) annex. The FY 1978 effort was coordinated with the other services and included available data from NATO initiatives and derivatives. Planning for a project office was initiated.

2. FY 1979 Program: A project office will be organized and staffed on a minimal basis. The ASH Special Study Group (SSG) will continue efforts to refine the ROC, develop a concept formulation package with its myraid of trade-off determinations, trade-off analyses, and best technical approaches. Concept formulation efforts will culminate in a Cost and Operational Effectiveness Analysis (COEA). The results will be included in the SSG Final Report which will accompany an up-dated Decison Coordinating Paper (DCP) with a MENS annex through an ASARC to DSARC II. Results of the DSARC will be incorporated in the Request for Proposlas (RFP) which will be readied for release.

3. FY 1980 Planned Program: The RFP developed and refined in FY 1979 will be released to industry. Proposals resulting from the RFP will be evaluated and contractor selection will be made in the third quarter. Contract awards for contractors (airframe and visionics) will also be made in the third quarter. The contractors will initiate detail engineering design and procure critical long lead time items.

4. FY 1981 Planned Program: Engineering design will continue, hardware assembly will begin for system prototype development and the remaining long lead time items will be procured.

5. Program to Completion: Full-scale development will be completed and development and operational tests conducted prior to award of production contracts. Maturity development will correct deficiencies noted during the tests.

Program Element: #6.42.03.A
DoD Mission Area: #411 - Battlefield Surveillance

Title: Aerial Scout
Budget Activity: #2 - Tactical Programs

J. TEST AND EVALUATION DATA: A development and operational test program will be developed appropriate to the specific program alternative and acquisition strategy selected by the Department of the Army. This selection will be made subsequent to the concept formulation effort currently in progress.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.04.A
DoD Mission Area: #441 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	228	443	450	1450	Continuing	Not Applicable
DC 32	Ground Support Equipment	60	52	0	500	Continuing	Not Applicable
DC 33	Cargo Handling Equipment	168	200	200	350	Continuing	Not Applicable
DC 45	Aviation Life Support Systems	0	191	250	600	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops items of equipment, excluding aircraft, that support the Army air mobility concept. The program leads to the production of the items which are directly applicable to the aircraft or which support the aircraft fleet. Army aircraft must fly at low levels, often under conditions of reduced visibility, to evade enemy air defense systems. These operating conditions demand improved aircraft subsystems and components to enhance the efficiency, safety, and survivability of air crewmembers operating in a hostile environment. New and improved ground support and cargo handling and aviation life support equipment is required to minimize aircraft turnaround times and to maximize efficient operations and maintenance, especially in forward battle areas. Project D279, Airdrop Equipment Development, has been removed from this program and redesignated 6.42.18.A, D279.

C. BASIS FOR FY 1980 RDTE REQUEST: Aviation Life Support Equipment continues contractual efforts for development of Floatation Kit for Helicopter Aircrewmen and enters Development Testing/Operational Testing (DT/OT) II in mid FY 80. Contractual actions for development of oxygen systems for search and rescue (SAR) helicopters continues. Initiate early contractual actions (incrementally funded) for the On-Board Oxygen Generating System (OBOGS) for use on special mission aircraft (RV-1D/RU-21). Completion of DT/OT II for Improved Lighting System for Army Aircraft (ILSAA-I). Cargo Handling Equipment provides Army airdrop/air transportability evaluation and interface with US Air Force Tactical Airlift Modernization Program. Provides for participation in test design and prototype modifications to the Advanced Medium STOL Transport (AMST) in accordance with Army tactical airlift requirements. Continues joint Air Force/Army DT and initiates joint OT of the air transportability/airdrop capabilities of the C-141B (Stretch) Transport Aircraft.

Program Element: #6.42.04.f
DoD Mission Area: #441 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	829	1095	1595	Continuing	Not Applicable

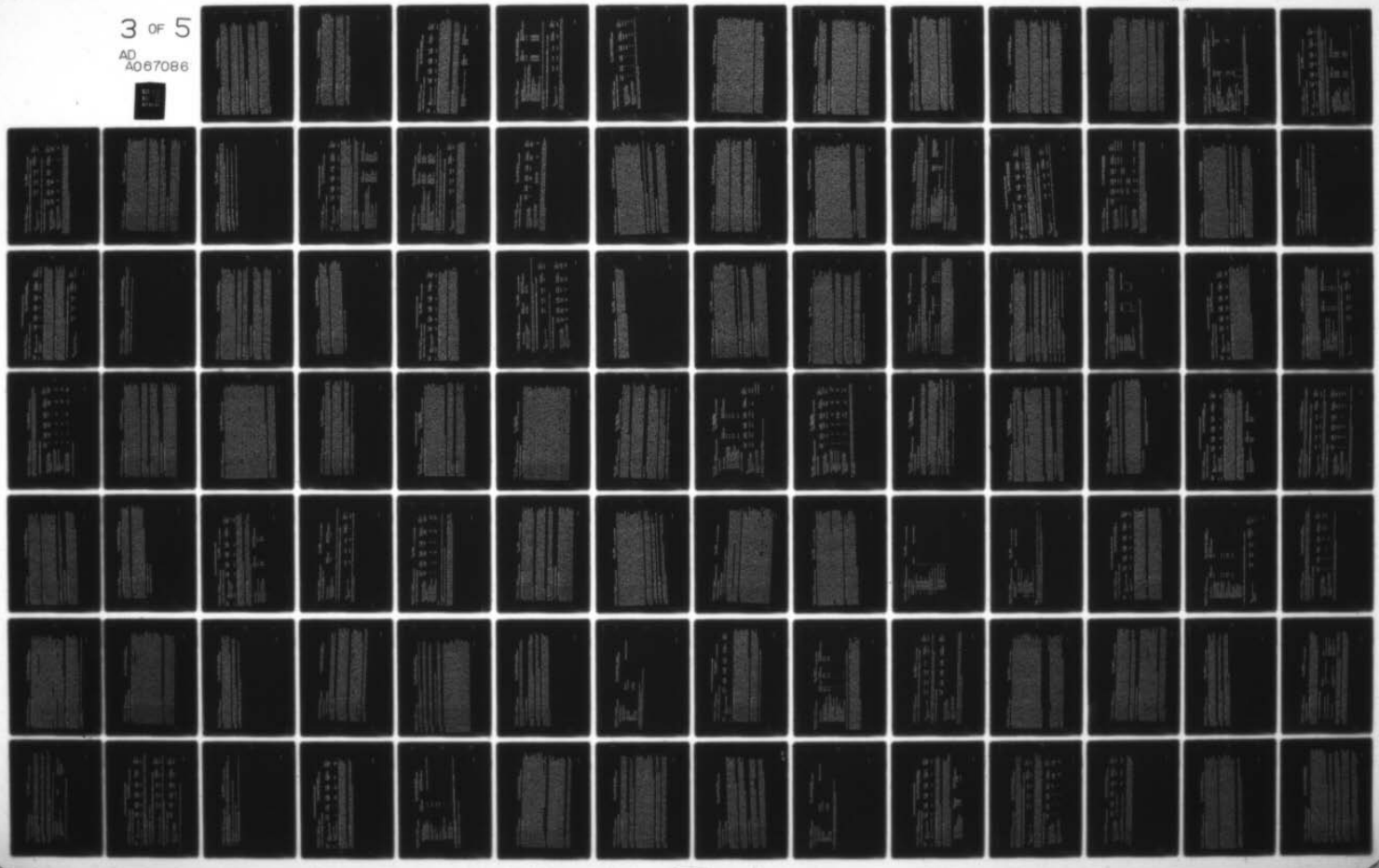
The major difference in the FY 1980 funding profile is caused by the movement of D279, Airdrop Equipment Development, from Program Element 6.42.04 to 6.42.18, Airdrop Equipment Development. This is consistent with a decision to provide increased emphasis and intensive management. Remainder of adjustments (FY 1978 and FY 1979) reflect general realignments of priorities for helicopter anti-de-icing diagnostics and inspections and aviation life support (previously titled Subsystems and Components).

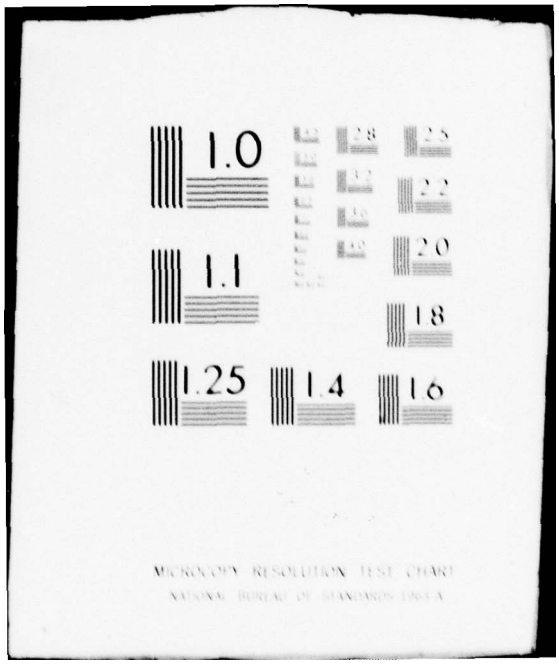
E. OTHER APPROPRIATION FUNDS: Not Applicable.

AD-A067 086 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 5/1
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
JAN 79

UNCLASSIFIED NL

3 OF 5
AD A067086




1.0
1.1
1.25
1.4
1.6
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Program Element: #6.42.04.A
DoD Mission Area: #441 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This ongoing program element (P.E.) combines past efforts of ground support equipment, cargo handling developments, and aviation life support equipments. Engineering development of ground support equipment is to develop equipment applicable to the servicing and maintenance of Army aircraft. The aerial delivery and cargo handling projects are to develop slings, nets, and devices to optimize the rapid movement by helicopter of equipment and supplies to and within forward areas. Development of aviation life support equipment will continue in order to enhance the overall safety and survivability of Army aircrewmen.

G. RELATED ACTIVITIES: Program Elements 6.32.09.A, Air-Mobility Support; 6.22.09, Aeronatical Technology; and 6.22.10.A, Airdrop Technology in coordination with Joint Technical Coordinating Group (Air Force Program Elements 6.42.28.F, Tactical Airlift Modernization; and 4.11.18, C-141 Stretch Modification), and NATO Standardization agreements. US Army Materiel Development and Readiness Command/US Army Training and Doctrine Command (DARCOM/TRADOC) Life Support Steering Council. US Army Aviation Research and Development Command (AVRADCOM)/TRADOJoint Working Group for Aviation Life Support Equipment (ALSE) Development.

H. WORK PERFORMED BY: Barnes & Renecke, Chicago, IL; Brooks & Perkins, Incorporated, Livonia, MI; Pioneer Recovery Systems, Manchester, CT; Boeing-Vertol, Philadelphia, PA; Naval Air Development Center, Warminister, PA; US Army Natick Research and Development Command, Natick, MA; US Army Aviation Research and Development Command, St. Louis, MO.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Ground Support Equipment: Completed development test and field evaluation of a self-propelled crane, cleaning and de-icing system and weapons handling vehicle in support of aircraft maintenance. Completed development of helicopter rotor dynamic balancing and tracking kit, which has been type classified standard, and is now in production. Cargo Handling Equipment: Helicopter Slings, 10,000 and 25,000 lb capacity slings completed Development Testing/Operational Testing (DT/OT) II tests and were type classified Standard. Helicopter cargo nets have completed tests and are awaiting refinement of the technical drawings package, prior to type-classification action.

2. FY 1979 Program: Ground Support Equipment: The effort supports development and staffing of Letter Requirements (LR) for small Portable Analyzer-Diagnostic Equipment (SPADE). Cargo Handling Equipment: Aerial Delivery Platform will be operationally tested. Participate in joint Service source selection of Advanced Medium STOL Transport (AMST) and joint Service developmental testing of the C141B for air transportability capability to transport/airdrop Army personnel and equipment. Aviation Life Support Equipment: Development of the Flotation Kit for Helicopter Crewmen will be supported by an incrementally funded contract awarded early in FY 79. Development of the Helicopter Oxygen System will be initiated in FY 1979. This is to fill a safety problem now existing in Search and Rescue Units. Development of Improved Lighting System for Army Aircraft (ILSAA) will be initiated early in FY 1979.

Program Element: #6.42.04.A
DoD Mission Area: #441 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Cargo Handling Equipment: Initiate development of vehicle net and pallet system, Spreader Bar and Apex fitting. Participate with Air Force in Tactical Airlift Modernization Program and in testing/development of AMST. Continue Joint Air Force/Army Developmental Testing/Operational Testing (DT/OT) of airdrop/air transport capabilities of C141B Transport Aircraft. Aviation Life Support Equipment: Complete DT/OT II test of Flotation Kit for Helicopter Aircrewmen. Late in FY 1980 conduct Development In-Process Review (DEVA-IPR) for type classification to Standard. Complete contractual action on Helicopter Oxygen System. Enter item into DT/OT II tests late in FY 80. Initiate engineering development for On-Board Oxygen System (OBOGS) for use by special mission aircraft (RV-1D/RU-21). Contractual action will continue into FY 1981. Complete DT/OT II test of Improved Lighting System for Army Aircraft (ILSAA). Initiate action at DEVA-IPR for type classification Standard.

4. FY 1981 Planned Program: Ground Support Equipment: Initiate engineering development of the Small Portable Analyzer Diagnostic Equipment (SPADE) and expand this diagnostic technique to include the various aircraft models. Cargo Handling Equipment: Continue contractual action for vehicle net and pallet system. Initate DT/OT II in 3QFY1981. Enter spreader bar and apex fitting into DT/OT II. Continue Army evaluation of Advanced Medium STOL Transport (AMST). Provide Army input for AMST design. Aviation Life Support Equipment: Enter Helicopter Oxygen System into DT/OT II. Continue contractual action for the On-Board Oxygen Generating System (OBOGS). Developmental testing scheduled for late FY 1981.

5. Program to Completion: This is a continuing program. Army participation in the AMST development will continue until the scheduled joint follow-on evaluation in FY 1985. The OBOGS program is scheduled for type classification in late FY 1983. Fielding of the SPADE diagnostic equipment is scheduled for 3QFY1984.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	164869	177449	176194	137339	0	1008310
	QUANTITIES						9
D425	Advanced Attack Helicopter	164869	177449	176194	137339	0	1008310

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Under this program, the Army is developing an Advanced Attack Helicopter (YAH-64) anti-armor weapon system. The YAH-64 is a twin engine rotary wing aircraft designed as a stable, manned aerial weapon vehicle. It will be capable of defeating a wide range of targets, but is optimized for destruction of armored vehicles. The AAH will provide responsive direct aerial fires as an integral element of the ground combat units and be capable of performing its mission at night and under adverse weather conditions. This weapon system is required to contribute highly mobile, effective and accurate firepower to the anti-armor capability of the Army in the field. Aircraft armament includes the HELLFIRE antitank missile system, 30mm automatic gun and 2.75" rockets. The AH-64 will become the primary attack helicopter and will be complemented by the AH-1 series attack helicopters. The program is currently in Full Scale Engineering Development (Phase 2), which was preceded by competitive airframe development.

C. BASIS FOR FY 1980 RDTE REQUEST: Contractor and Government development testing will continue. The Government will conduct a flight evaluation of the competing Target Acquisition Designation Systems and Pilot Night Vision Systems (TADS/PNVS) and select the winner to be integrated into the air vehicles for further development and operational testing. The Government will conduct a user Operational Test (OT IIa) to evaluate the aircraft, fully equipped with its subsystems, to provide development data for the production decision in FY 1981.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Award Aerial Vehicle Development Contract (Phase I)	Jun 1973	Jun 1973
First Flight	Sep 1975	Sep 1975

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Complete Air Vehicles Fly-Off	Sep 1976	Sep 1976
Award Full Scale Engineering Development Contract (Phase 2)	Dec 1976	Dec 1976
Award Competitive Target Acquisition Designation Systems and Pilot Night Vision Systems (TADS/PNVS) Contracts	Mar 1977	Mar 1977
Competitive TADS/PNVS Selection	Apr 1980	Mar 1980
Complete Operational Test (OT) IIa	Sep 1980	Sep 1980
Production Contract Award	Dec 1980	Dec 1980
Complete OT IIb	Aug 1981	Aug 1981
First Production Delivery	Dec 1982	Dec 1982
Initial Operational Capability (IOC)		

Competitive TADS/PNVS selection moved from March to April 1980 to meet data analysis requirements and review by the Source Selection Evaluation Board.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	164870	177449	172827	118496	986203

FY 1980 cost estimate increased from that in the FY 1979 budget submission due to the updating of the program's baseline cost estimate, the addition of Skill Performance Aids (improved technical manuals and training data) and escalation due to the application of updated inflation indices.

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement, Army						
Funds (current requirements)	0	0	0	318033	2854600	3172633
Funds (as shown in FY 1979 submission)	0	0	0	318600	2834500	3153100
Quantities (current requirements)	0	0	0	18	518	536
Quantities (as shown in FY 1979 submission)	0	0	0	18	518	536

The difference in the funding profile between FY 1980 and FY 1979 Congressional Descriptive Summaries is due to application of updated inflation indicies and adjustment of spares funds.

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In September 1972, the US Army approved an Advanced Attack Helicopter (AAH) development program to develop an attack helicopter with greater agility, hover performance and a greater aerial fire support capability than currently available in existing Army aerial weapons systems. The AAH program was presented to the Defense System Acquisition Review Council (DSARC 1) and, on 10 November 1972, the Deputy Secretary of Defense authorized release of the AAH Request for Proposals (RFP). This specified a $1.4M to $1.6M (FY 72 constant dollars) constraint on the recurring fly-away design-to-unit production cost, based upon an initial production buy of 472 aircraft. In April 1976, the planned procurement quantity was subsequently increased to 536 aircraft. The RFP stressed acquisition and operating costs as prime considerations in the program and in the competitive selection between contractors. As a result of the HELLFIRE DSARC on 26 February 1976, it was decided that the HELLFIRE missile would be utilized as the point target weapon for the AAH in lieu of the initially proposed Tube Launched, Optically Tracked, Wire Guided (TOW) Missile System. On 23 March 1976 the DSARC directed the Target Acquisition Designation System (TADS) and the Pilot Night Vision System (PNVS) be competitively developed. with fly-off on the YAH-64. Development of the YAH-64 consists of two phases. The first phase was conducted as a fly-off of two prototypes each from the competing contractors, Bell Helicopter Textron and Hughes Helicopters, to insure airframe acceptability in the critical area of flight handling qualities and performance. Competitive development contracts for Phase 1 were awarded to Bell Helicopter Textron and to Hughes Helicopters. Government testing (fly-off) was completed on 30 September 1976. The AAH DSARC II, held on 7 December 1977, resulted in approval of the AAH to enter full scale engineering development (Phase 2). On 10 December 1976 the Secretary of the Army selected Hughes Helicopters (YAH-64) as the prime aircraft system contractor for Phase 2. Phase 2 consists of modification of the two Hughes Helicopters Phase 1 aircraft, fabrication of three additional air vehicles, subsystems development and integration and testing of the total weapons system. Of particular importance to the AAH Program is the competitive development of TADS/PNVS currently on contract with Martin-Marietta and Northrop Corporation. Fly-off and selection of the winning contractor is currently scheduled for April 1980, and is considered a critical Milestone in the AAH Program. At the direction of the Office of the Secretary of Defense, the use of the XM552 (WECOM-30) ammunition for the 30mm gun on the YAH-64 was obviated in favor of development of an ADEN/DEFA compatible round to provide interchangeability and interoperability with NATO and other US 30mm guns. The YAH-64 Program Manager has development responsibility for this ammunition. A Project Manager for the TADS/PNVS development and a Product Manager for 30mm Aircraft Gun Type Ammunition have been designated to assist the Advanced Attack Helicopter Program Manager in the development of the AAH system.

G. RELATED ACTIVITIES: The Army AH-1S COBRA/TOW, Program Element (PE) 6.42.12.A, and the Marine Corps AH-1T are related helicopters. The AH-1S provides the Army an early aerial antitank capability with the TOW missile until the availability of the higher performance YAH-64 and is planned as a complement to the YAH-64 in a high-low mix. The AH-1S and AH-1T lack performance, night vision devices and survivability characteristics required in the AAH. The General Electric T700 engine installed in the YAH-64 is being managed by the BLACK HAWK Project Manager (PE 6.42.06.A). The Heliborne Missile - HELLFIRE is being developed under PE 6.43.10.A. The 30mm ADEN/DEFA ammunition is being developed under PE 6.42.02.A, Aircraft Weapons.

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

H. WORK PERFORMED BY: Hughes Helicopters, Culver City, CA, is the airframe and 30mm ammunition developer and is responsible for the total weapon system integration in Phase 2. General Electric Company, Lynn, MA, is the manufacturer of the government furnished T700 engine. Martin-Marietta, Orlando, FL, and Northrop Corporation, Anaheim, CA, are the two competitive contractors for development of the Target Acquisition Designation System (TADS) and the Pilot Night Vision System (PNVS). The Advanced Attack Helicopter (AAH) Program Manager's Office, located at the US Army Aviation Research and Development Command, St. Louis, MO, is responsible for the development program.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Competitive contracts for Phase 1 development were awarded to Bell Helicopter Textron and Hughes Helicopters on 22 June 1973. Phase 1 development concentrated on aerial vehicle development. Phase 2 was scheduled to include subsystems development and subsystems integration into the total weapons system. Throughout FY 1974 and 1975 and until the latter part of FY 1976, each of the contractors designed, fabricated and tested a Ground Test Vehicle (GTV) and two prototype air vehicles. On 30 September and 1 October 1975, respectively, Hughes Helicopters and Bell Helicopter Textron made first flights with their prototypes and began the contractor flight test programs. On 31 May 1976, each contractor delivered two flyable prototype aircraft to the Government for flight training, testing and evaluation. Flight testing was successfully accomplished on 30 September 1976. Source selection activities, which began in July 1976 when the Army received Phase 2 proposals from each of the contractors, were completed with the selection of Hughes Helicopters as the winning contractor. A contract award for full scale engineering development was made on 10 December 1976. TADS and PNVS proposals from industry were received by the Army in November 1976, and TADS/PNVS Contracts were awarded to Martin-Marietta and Northrop Corporation on 10 March 1977. During FY 1977, Hughes Helicopters initiated engineering design efforts to incorporate configuration changes identified by the Phase I Source Selection Evaluation Board. Testing was also initiated on the GTV and air vehicles to support the Phase 2 prototype modification effort. Due to restructuring of the original FY 1978 budget request, fabrication of the additional three prototypes was delayed from FY 1977 until FY 1978. During FY 1978, design, fabrication and assembly of the three additional prototype aircraft was initiated. Design and fabrication of the major subsystems, particularly those associated with the fire control, began to be integrated into the airframe. The TADS and PNVS contractors finalized their designs and began assembly and ground tests of the systems.

2. FY 1979 Program: Major effort will be expended in fabrication of the three additional flying prototypes. Two of these aircraft will be ready for flight in the latter part of the year. First delivery of the TADS/PNVS systems will be made to Hughes by the associate contractors. These systems will be given a thorough ground evaluation on the mission subsystems simulator prior to their integration into the flight vehicles. A major effort will be directed toward integration of all elements of the fire control system into the prototypes. The first HELLFIRE missiles will be fired starting with ballistic missiles and moving toward the live firing phase in the latter part of the fiscal year. The GTV will be completely updated to incorporate the latest engineering changes and will begin a series of tests to formally qualify the various dynamic components to support the reliability objectives. The Phase 1 air vehicles will be utilized in the initial part of the fiscal year for flight loads surveys,

stores jettison tests, dynamic stability tests and flying qualities evaluations. In the latter part of the fiscal year, the armament and fire control surveys will begin. Government pilot training will be accomplished in preparation for Target Acquisition Designation System (TADS)/Pilot Night Vision System (PNVS) evaluation and flyoff scheduled to take place early in the following year.

3. FY 1980 Planned Program: Fiscal 1980 will be the most active year of the AAH Phase 2 test program. All five of the YAH-64's will be involved in various flight test programs. Concurrently, the Ground Test Vehicle (GTV) will be operating extensively to formally qualify the vehicle transmission and power train. Early in the fiscal year, the Army will conduct an Engineering Design Test (EDT-3) to verify the flight characteristics of the two TADS/PNVS equipped AAH's in preparation for the competitive flyoff. The flight evaluation of the competing TADS/PNVS systems will be conducted on 2 aircraft during a 3 month period and the results considered by an Army Source Selection Evaluation Board (SSEB) for selection in April 1980 of a winning contractor to continue into the TADS/PNVS maturity phase. The winning contractor's TADS/PNVS will then be installed into 3 of the remaining aircraft. Four complete systems equipped aircraft will continue contractor development testing to mature the integration until Operational Test (OT IIA) is conducted in the last month of the fiscal year. The fifth aircraft is instrumented for measuring flight loads, vibration, dynamic stability, and structural integrity and does not have the mission equipment installed. This vehicle is in contractor flight test for demonstration of airworthiness and flight characteristics for the entire year except for a two week period when the Army flies the vehicle (EDT-4) to verify the overall flight characteristics.

4. FY 1981 Planned Program: Based upon the results of contractor and government development testing of systems to date, including the TADS/PNVS flyoff and the independently conducted OT IIa, the Army will present the program to the Army and Defense Systems Acquisition Review Councils (ASARC/DSARC III) in November 1980, leading to production contract award for the AH-64 and the TADS/PNVS in December 1980. Contractor and government flight testing will continue on all five vehicles with emphasis of reliability, availability and maintainability (RAM) culminating in a user assessment of RAM during OT IIb in July and August 1981.

5. Program to Completion: Prototype testing associated with Phase 2 Full Scale Engineering Development is scheduled to be completed in August 1981. Funding to cover engineering changes, expected to be forthcoming from Operational Testing, has been included in the AAH production estimate.

Program Element: #6.42.07.A
DoD Mission Area: #413 - Fire Support

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation (DT&E): Competing Advanced Attack Helicopter (AAH) contractors, Bell Helicopter Textron and Hughes Helicopters, successfully completed Phase I development testing on 30 September 1976. Phase I testing included contractor design support tests, testing of individual components to verify structural integrity and establish fatigue life, and bench testing of dynamic components. Complete dynamic system testing was conducted utilizing the Ground Test Vehicle (GTV) beginning in April 1975. Following successful completion of GTV qualification testing, first flights occurred on 30 September and 1 October 1975 for Hughes and Bell, respectively. Each contractor completed more than 300 hours of flight testing prior to delivery of two flight vehicles each to the Army on 31 May 1976. This contractor flight testing was oriented primarily toward flight envelope development, demonstration of structural integrity, and evaluation and verification of aircraft flight handling qualities. Limited in-flight firing tests of the 30mm cannon and 2.75-inch rockets were also conducted.

Development Test (DT) I was conducted by the Army Engineering Flight Activity (AEFA) at Edwards Air Force Base, California, during July-September 1976. These tests were conducted primarily to evaluate flight handling qualities and aircraft performance and included in-flight firing of the 30mm cannon and 2.75-inch rockets. Reliability, availability and maintainability (RAM) data were obtained throughout the DT test program. The Hughes YAH-64 was selected by the Army to enter Engineering Development (Phase II) and a contract was awarded on 10 December 1976. During Phase I Government competitive tests (GCT), which combined developmental and operational testing on the YAH-64, the major deficiencies identified included controllability problems in sideward flight, an unreliable auxiliary power unit and engine starting system, and structural inadequacy of the cooling fan associated with the infrared suppression system. Necessary design changes have been made in Phase II as discussed below.

Since Phase I was primarily a competitive airframe development program, testing to date has not included the complete mission equipment package. YAH-64 testing has not included the HELLFIRE Missile system, Target Acquisition Designation System/Pilot Night Vision System (TADS/PNVS), weapons fire control, or navigation systems. The development, integration, test and evaluation of these critical subsystems is the primary purpose of the Phase II program.

Phase II Development Test (DT) makes maximum use of contractor/Government integrated tests to eliminate duplication. Initial contractor DT in Phase II has further expanded the aircraft flight envelope and evaluated changes/modifications that had been proposed to the Phase I design. The first set of modifications (MOD 1) incorporated a redesigned empennage, improved augmented stabilization equipment, a new infrared suppressor and removed the unreliable cooling fan. Findings from the Government Engineering Design Test (EDT-1), conducted in May 1978 to evaluate the MOD 1 changes, indicate improved sideward flight characteristics, improved handling qualities (particularly in the areas of static longitudinal stability, pitch-to-side-slip coupling and control breakout forces), and much improved RAM with the deletion of the unreliable cooling fan. Subsequent to EDT-1, a second set of modifications (MOD 2) have been installed on the flight prototypes. This includes installation of a new

auxiliary power unit to overcome the aforementioned deficiencies of this unit and the starting system. Progress in the modification program to date has been very satisfactory. Concurrently, bench testing of subsystem components is being conducted prior to the first flight of a full subsystem equipped aircraft. Through FY 1978 in Phase 2, 51 hours of ground testing on the Ground Test Vehicle (GTV), 260 hours of flight testing on the two prototype aircraft, and approximately 800 hours of subsystem bench tests have been accomplished. Since the Target Acquisition Designation System/Pilot Night Vision System (TADS/PNVS) program is also a competitive development, one each of the two TADS/PNVS designs will be installed on two YAH-64 prototypes to be used in a competitive selection. Following TADS/PNVS selection, all four subsystem aircraft will be equipped with the winning TADS/PNVS for final qualification testing and for use in Operational Tests (OT) IIA and IIB. Firing of the weapons systems, HELLFIRE, 30mm and 2.75-inch rockets, will also be conducted. Approxim tely 1,570 hours of contractor and 350 hours of Government DT II flight testing are scheduled in Phase II. Production testing will be scheduled to evaluate production aircraft.

2. Operational Test and Evaluation: Operational Test (OT) I was conducted in September 1976 at Edwards Air Force Base, California, by the US Army Operational Test and Evaluation Agency (OTEA) in conjunction with Development Test (DT) I. Approximately 16 hours were flown on each contractor's design during this test utilizing representative attack helicopter mission profiles. Emphasis was placed on evaluating aircraft flight and detectability characteristics and mission performance in a low level and nap-of-the-earch (NOE) operational environment. Military crews for the competitive flight tests consisted of an Army Engineering Flight Activity (AEFA) test pilot as pilot, and an experienced attack helicopter pilot from the US Army Forces Command (FORSCOM) units as co-pilot/gunner. Operational Army maintenance personnel observed all maintenance activities. The current Army attack helicopter (AH-1S) was concurrently flown on all YAH-64 missions to establish comparative baseline information. The full weapons, visionics, and navigation subsystems were not tested during OT I. OTEA prepared an independent evaluation of OT I which was briefed to the Army Systems Acquisition Review Council in December 1976. OTEA concluded that the Advanced Attack Helicopter (AAH) was suitable for continuation into the next phase. The major discrepancies identified were those associated with the auxiliary power unit and starting system. These were previously discussed in the Developmental Test section.

OT II testing will be conducted in two phases. OT IIA is scheduled to be conducted by OTEA, separate from development tests, during September 1980 at Yuma Proving Ground, AZ. The primary purpose of this test is to permit operational evaluation of the full subsystems equipped aircraft prior to a production decision. This test will include firing of the HELLFIRE, 30mm, and 2.75-inch rocket systems and nonfiring exercises. Four YAH-64 prototype aircraft equipped with the selected TADS/PNVS subsystems will be utilized, for a total of approximately 110 flight hours. Flight crews and maintenance personnel will be provided by FORSCOM. OTEA will prepare an independent evaluation of Operational Test (OT) IIA.

OT IIB is scheduled to be conducted by OTEA during July-August 1981 at a site yet to be selected. An estimated 240 hours will be flown utilizing three fully equipped YAH-64 prototype helicopters under a complete range of flying conditions and mission profiles. OT IIB is designed to continue operational suitability testing, with emphasis on reliability, availability, and maintainability (RAM). OTEA will prepare an independent evaluation of OT IIB prior to increasing to full rate production.

3. Systems Characteristics: Following are the major performance characteristics that are the basis for technical assessments during the second phase of development. Performance requirements are at 4000 feet/95 degrees Fahrenheit.

Operational/Technical Characteristics*	Objective	Demonstrated Performance **
Primary Mission Gross Weight (PMGW)-lbs	13,910	13,920
Cruise Airspeed @ PMGW (Knots)	145-175	142
Vertical Rate of Climb @ PMGW-(feet per minute)	450-500	470
Mission Reliability	.95	
Weapon Accuracy (P_H)	[redacted]	
30mm		
HELLFIRE		
Lateral acceleration (g's)	.25-.35	.29
Endurance (hrs) - Primary Mission	1.83	1.83
- Alternate Mission	2.5-2.8	2.50
Expendable Ordnance @ PMGW		
HELLFIRE Missile (No.)	8-16	
30MM (rds)	320-500	
Target Recognition (km) Maximum - Day	[redacted]	
- Night		
Target Designation (km) Maximun		
Day		
Night		

NOTES: * Performance required at primary mission gross weight, operating within specified mission profiles.
** From the Source Selection Evaluation Board (SSEB) final report; based on Government Development (DT) I YAH-64 data and adjusted to the approved armament configuration.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.12.A
Title: COBRA/TOW
DoD Mission Area: #413 - Fire Support
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	12778	10827	1000	TBD	TBD	TBD
D639	COBRA/TOW	12778	10827	1000	TBD	TBD	TBD

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The COBRA/TOW is a single rotor, two-seat attack helicopter designed to provide the Army with an early heliborne antitank capability. Earlier RDTE funds were used to integrate the TOW missile system with the AH-1G (COBRA) helicopter and initiate a program to improve the aircraft agility and maneuverability. Development effort continues to improve the aircraft rocket subsystem, fire control, and an automatic gun type weapon.

C. BASIS FOR FY 1980 RDTE REQUEST: The requested funds will be primarily for completion of the development and flight qualification of the fire control and rocket management subsystems.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Weapons Fire Control:		
Development Contract Award	Dec 1976	Dec 1976
Delivery of Prototype Hardware	May 1978	Feb 1978
Informal In-Process Review	Nov 1978	Sep 1978
Initial Production Contract Award	Nov 1978	Oct 1978
Test Completed		
Upgunning		
Development Contract Award	Jun 1976	Jun 1976
Delivery of Prototype Hardware	Sep 1977	Sep 1977
Informal In-Process Review	Jun 1977	Jun 1977
Initial Production Contract Award	Jul 1977	Jul 1977
Test Completed		

The Weapons Fire Control Milestones have slipped from previous submission due to late delivery of fire control computer and related hardware by vendor to the prime contractor.

Program Element: #6.42.12.A
DoD Mission Area: #413 - Fire Support

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	14398	10827	2000	0	59063

Requirement changes in FY 1978 and 1980 reflect the decision to defer funding of the 30mm cannon program.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements)	141200	120300	30900	0	0	506500
Funds (as shown in FY 1979 submission)	130100	140700	31300	-	0	506900
Quantities (current requirements)	83	66	15	-	0	312
Quantities (as shown in FY 1979 submission)	83	78	15	-	0	324

The FY 1978 procurement increase was caused by an increased overhead burden born by the AH-1 due to a lower than anticipated workload at Bell Helicopter, Ft. Worth, TX, Cost Accounting Standard (CAS) 410 implementation and program acceleration to fully modernize a production aircraft by 199 vs 232. FY 1979 reduction occurred during the FY 1979 Appropriation process. FY 1980 estimates decreased because a reduced inflation index was used for FY 1979 budget preparation. FY 1979 procurement quantity was reduced twelve AH-1S by Congressional action.

Program Element: #6.42.12.A
DoD Mission Area: #413 - Fire Support

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: To fulfill an urgent requirement for an operational aerial antitank system, the Army initiated a development program to equip the AH-1G (COBRA) aircraft with the aerial Tube-launched Optically tracked Wire-guided (TOW) missile system. The development contract to accomplish this was awarded in March 1972. Eight AH-1G aircraft were modified with the aerial TOW system for the development and testing efforts that began in FY 1973. An AH-1G modified with the TOW system was designated AH-1Q. During operational testing of the AH-1Q, it was determined that it had certain performance limitations resulting from the additional weight of the TOW missile system. A Product Improvement Program (PIP), designed to alleviate the performance limitations in the area of hover performance and payload capabilities, was initiated during FY 1974. The program was low risk as the engine was state-of-the-art and is similar to an engine that had already undergone extensive testing. The transmission gear boxes and tail rotor were components already in service on the Marine Corps AH-1J helicopter. An AH-1Q modified by the installation of these components has an increase in maximum gross weight from 9,500 pounds to 10,000 pounds and was designated the AH-1S. Funds were approved in FY 1974 and FY 1975 to modify 290 existing AH-1G's. Additional funds were approved in FY 1978 to convert and modernize 11 more AH-1G COBRA's to the AH-1S COBRA/TOW configuration as the initial effort toward modernizing the remainder of the existing AH-1G fleet. Funds were approved in FY 1975 thru FY 1978 to procure 231 AH-1S COBRA/TOW's as part of a 297 total new buy procurement program.

G. RELATED ACTIVITIES: Prior to the revised FY 1973 budget, the Improved COBRA Armament Program (ICAP), which incorporated the TOW missile system on the COBRA, had been previously identified in Program Element (PE) 6.42.02.A, Aircraft Weapons. The funds for this armament subsystem were shifted in FY 1977 to this program element. Also shifted to this element was the advanced technology program to develop a new COBRA main rotor blade. This advanced composite material blade was previously funded under Advanced Structures, PE 6.32.11.A. This restructuring consolidates all ongoing developmental COBRA improvement projects under this single program element (6.42.12.A) to obtain optimum program management. Office of the Secretary of Defense approved development of both the Army AH-1S and Marine AH-1J helicopters because of different mission requirements.

H. WORK PERFORMED BY: Contractors: Bell Helicopter Textron, Ft. Worth, TX - Airframe; Kaman Aerospace Corp., Bloomfield, CN; General Electric Armament Division, Burlington, VT - Turret. In-house organizations: Aviation Research and Development Command, St. Louis, MO; and Ammunition Research and Development Command, Rock Island, IL. The program is managed by the Project Manager, COBRA, US Army Troop Support and Aviation Readiness Command, St. Louis, MO.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Development and qualification, including contractor and government testing, of the Universal Turret (UT) and Rocket Management Subsystem (RMS) was completed in October 1978. Due to the lack of a maintenance support package for the RMS, testing of the system was delayed until fall of 1979. Production deliveries with the UT subsystem began in September 1978. Aircraft will be delivered with provisions for the RMS, however, the hardware will not be delivered until completion of testing. Fabrication of the prototype fire control subsystems completed and initial testing began in September 1978. Initial testing will culminate in the Critical Issues Demonstration scheduled for October thru November 1978.

Program Element: #6.42.12.A
DoD Mission Area: #413 - Fire Support

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Engineering Development and testing of the weapons fire control subsystem designed to upgun and modernize the AH-1S attack helicopter will continue. Ground operational checks, aerial non-firing performance tests, and aerial firing performance tests to verify accuracy and performance in all functional modes of pilot heads-up-display (HUD), fire control computer (FCC), air data system (ADS), and laser rangefinder will be accomplished.

3. FY 1980 Planned Program: Complete development and testing of the weapons fire control subsystem and rocket management subsystem.

4. FY 1981 Planned Program: Initiate engineering development of the 30mm, XM230 Chain Gun, for the AH-1S Turret System.

5. Program to Completion: Currently, it is anticipated that all development efforts will be completed in FY 1983.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.13.A
DoD Mission Area: #441 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	32057	19540	23146	564	Complete	114824
	QUANTITIES						3
DC37	CH-47 Modernization	32057	19540	23146	564	Complete	114824

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The need for a medium lift helicopter capability is projected to continue beyond the year 2000. The age of the current fleet required that a modernization and/or procurement program be established. A modernization of the CH-47 fleet was determined to be the most cost effective approach. This program provides for incorporation of advances in design technology developed since introduction of CH-47 helicopters into Army inventory. The program is to modernize the current CH-47 fleet through development, test, and incorporation of seven new systems: rotor, drive, hydraulic, electrical, advanced flight control, cargo handling, and auxiliary power unit. Integration of these changes through a remanufacturing program will result in improved reliability, availability, maintainability, productivity, safety, and survivability, while reducing vulnerability and providing a 20 year life after modernization.

C. BASIS FOR FY 1980 REQUEST: The funds requested will provide for the completion of contractual engineering development effort, delivery of prototype aircraft to the US Army and testing necessary to assure that required Decision Coordinating Paper (DCP) reliability values are demonstrated and that critical test issues have been resolved prior to a production decision. Major milestones are as follows:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army Systems Acquisition Review Council (ASARC) II	August 1975	August 1975
Defense Systems Acquisition Review Council (DSARC) II	October 1975	October 1975
Modernization Research and Development (R&D) Contract Award	June 1976	June 1976
110-Hour Blade Whirl	March 1978	March 1978
Transmission Dynamic Strain Survey	November 1978 1/	March 1979
50-Hour Transmission Survey Run	December 1978 1/	April 1979
First Flight	May 1979 1/	September 1979
Preliminary Airworthiness Evaluation	October 1979 1/	December 1979

Program Element: #6.42.13.A
DoD Mission Area: #441 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Long Lead Time Items Contract Award	October 1979	Not Shown
Development Testing (DT) II/Operational Testing (OT) II Start	November 1979 1/	January 1980
Development Testing (DT) II/Operational Testing (OT) II Complete	April 1980 1/	June 1980
Army Systems Acquisition Review Council (ASARC) III	August 1980	August 1980
Defense Systems Acquisition Review Council (DSARC) III	September 1980	September 1980
Production Contract Award	October 1980	October 1980
Production Delivery Begins	May 1982	May 1982
Initial Operational Capability (IOC)	February 1984 2/	August 1983

1/ The CH-47 Modernization Program is ahead of contract milestone schedule. Milestone dates have been changed to reflect this acceleration.

2/ IOC changed due to increase in company authorization from 16 to 24 aircraft by Aviation Requirements for Combat Structure of the Army (ARCSA) III study and initial requirement for four trainers.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	32022	19540	10146	564	104649

FY 1980 - $13 million increase reflects program adjustment from the procurement appropriation to the RDTE appropriation for producibility engineering and planning. Total Estimated Costs - FY79 Descriptive Summary included $2.8 million from Program Element 6.32.14.A, Project DB37. Advanced development work related to drive and hydraulic systems for the CH-47 Modernization program was accomplished under this project. The Decision Coordinating Paper total program cost and the Selected Acquisition Report include only engineering development costs as the $2.8 million were deleted here. Change in total estimated costs also reflects the change decribed for FY 1980.

Program Element: #6.42.13.A
DoD Mission Area: #441 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Aircraft Procurement, Army:						
Funds (current requirements)	0	0	28770	146195	1490049	1665014
Funds (as shown in FY 1979 submission)	0	0	39554	-	1472061	1511615
Quantities (current requirements)			Long Lead Items	9	352	361
Quantities (as shown in FY 1979 submission)			Long Lead Items	-	361	361

FY 1980 - FY 1979 submission utilized December 1976 inflation indices. FY 1980 submission utilizes July 1978 indices and reflects transfer of $13 million from procurement to RDTE. Total Estimated Costs - Difference results from program adjustments from procurement to RDTE, reprofiling to satisfy additional long-lead requirements in FY 1980 and increased escalation from utilization of July 1978 indices.

Program Element: #6.42.13.A
DoD Mission Area: #441 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The CH-47 (Chinook) Medium Lift Helicopter (MLH) was developed in the late 1950's with the first CH-47s being procured in 1962. The Chinook provided invaluable battlefield mobility in Vietnam for tactical vehicles, artillery and engineering equipment, personnel, and logistical support equipment. The Chinook will continue in service to meet the Army medium lift requirement through the year 2000. The current Army inventory consists of 166 CH-47A models, 77 B models, and 210 C models. The CH-47A and B models fail to meet the Required Operational Capability (ROC) of 15,000 pound external payload for medium lift helicopters. All models have high operating costs, large maintenance requirements, and require modernization. Life cycle cost estimates and economic analysis of the CH-47 fleet indicated that is was more cost effective to modernize CH-47s than to retire these aircraft and procure new helicopters. A ROC was approved in October 1974 (Revised October 1975) and a Special Study Group (SSG) was formed in December 1975 to prepare the program for Army Systems Acquisition Review Council (ASARC) II and Defense Systems Acquisition Review Council (DSARC) II. Based on the SSG findings, it was determined that modernization could best be accomplished by the incorporation of seven modernized subsystems. A Cost and Operational Effectiveness Analysis (COEA) was conducted which determined that the most cost effective approach would be to modernize a total of 361 fleet aircraft. The objectives of this program are to develop fiberglass rotor blades; a 7500 horsepower integrally lubricated transmission and drive system; modularized hydraulic system components; and accomplish the necessary engineering and design required to install a new electrical system, an improved auxiliary power unit, multiple cargo hooks, and advanced flight control system in a prototype of each of the three models. The program goals are to improve reliability, availability, maintainability, productivity, and safety while reducing operating costs and standardizing the Medium Lift Helicopter (MLH) fleet to a single configuration, the CH-47D.

G. RELATED ACTIVITIES: In FY 1975, advanced development work in drive and hydraulic systems related to CH-47 Modernization was conducted under Program Element 6.32.14.A, Project DB37.

H. WORK PERFORMED BY: A contract for engineering development of the airframe was awarded on 4 June 1976 to the Boeing Vertol Company, Philadelphia, PA; and on 28 July 1976, a contract for engine support was awarded to AVCO Lycoming, Stratford, CT. The CH-47 Modernization Project Manager's Office, St. Louis, MO, is the responsible developing organization.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Defense Systems Acquisition Review Council (DSARC) II was held 16 October 1975 and approved transition into engineering development in pursuit of a three prototype research and development (R&D) plan and program to modernize the CH-47 fleet at a rate of 3 per month for a total of 361 aircraft pending final force structure definition. A contract for engineering development effort was awarded to Boeing Vertol in June 1976. In early June 1976, three CH-47 aircraft, one each A, B, and C were delivered to Boeing Vertol for initiation of the prototype effort. On 28 July 1976, a contract for support of the CH-47 Modernization Program was awarded to the engine contractor, AVCO Lycoming.

Required Government-furnished engines and fuel controls have been provided to the engine contractor for the engine conversion program. Four of the engines have been delivered to the airframe contractor. All aircraft engineering drawings have been released. Hydraulic system module vendors have completed approximately 55 percent of the design and qualification effort. Subcomponents of the drive system have been received from vendors, assembled, and preliminary testing initiated. The contract for the advanced flight control system (AFCS), which will provide significantly reduced operations and support (O&S) costs, has been awarded. All fiberglass rotor blades have been completed. The 110-hour whirl test of the blade was accomplished in March 1978. Prototype aircraft have been inspected and airframe preparation accomplished. Airframe structural modification has been completed on #1 prototype and initiated on #2 and #3 prototypes. A requested Producibility Engineering and Planning (PEP) contractct proposal has been received. Fact-finding and evaluation have been accomplished and contract negotiations are ongoing.

2. FY 1979 Program: Program was ahead of schedule and on cost as it entered the new fiscal year. The remaining five engines will be delivered for interfacing with the #2 and #3 prototype airframes. Fiberglass rotor blade development testing and qualification will be completed, second and third ship sets made available, and fatigue tests accomplished. Dynamic strain survey of the five transmissions and a 50-hour milestone run on all transmissions have been completed ahead of contract schedule. In total, 950 hours of transmission testing will be accomplished. The contractor is performing to an accelerated schedule which provides a high confidence of roll-out of prototype #1 in March 1979 and first flight in May 1979, four months ahead of schedule. Prototypes #2 and #3 will complete first flight in FY 1979. Producibility engineering and planning effort is planned for initiation during this fiscal year.

3. FY 1980 Planned Program: Contractual development effort is scheduled for completion. Delivery of all prototypes will be made to the Government. Preliminary Airworthiness Evaluation and Development Test/Operational Test II (DT/OT II) testing, required to assure validity of design, substantiate accomplishment of reliability, availability, maintainability (RAM) requirements, and verify flight safety improvements, will be accomplished in the October 1979 to April 1980 time frame, two months ahead of the approved program schedule. The production phase decision will be made by Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III scheduled for August and September 1980, respectively.

4. FY 1981 Planned Program: PEP effort to assure effective producibility will be completed. Initial production contract will be awarded.

5. Program to Completion: This program will be completed in FY 1981.

Program Element: #6.42.13.A
DoD Mission Area: #441 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: Development test and evaluation is being conducted by the contractor, Boeing Vertol Company, the US Army Aircraft Development Test Activity (ADTA) and the US Army Aviation Engineering Flight Activity (AEFA) with contractor testing on all three prototypes and government testing on two prototypes. The contractor is performing to an accelerated schedule which permits the Government portion of development testing (DT II) to begin in November 1979 versus the prior schedule of January 1980. DT II will include ground and bench testing of new components and Prototype Qualification Tests (PQT-C) on the three prototype aircraft. Fiberglass rotor blade testing started in 1977. The 110-hour whirl tower test milestone was accomplished in March 1978. Bench testing continued through FY 1978 and has been completed. Flight tests and qualification of the fiberglass rotor blades have been completed for use on the CH-47C helicopter. This early qualification on the CH-47C reduces risk and increases the confidence in flight testing required in the CH-47 Modernization program. Transmission and hydraulic bench tests began in 1978 with the transmission dynamic strain survey and the 50-hour qualification test was completed in December 1978. Approximately 460 hours of a planned 950 hours of bench testing on the set of five transmissions has been accumulated. Bench testing and component qualification for the other improved systems is continuing on schedule. During bench qualification of the auxiliary power unit (APU), a cold temperature starting problem was encountered. This problem was resolved in September 1978 by minor changes to the APU hydraulic start and fuel systems. These changes have been tested and qualified. First flight is scheduled for May 1979. The contractor flight test program will begin at that time. Government testing will be conducted with aircraft essentially the same as the production model and will include Preliminary Airworthiness Evaluation (PAE), Icing, Design Verification, Climatic Hangar, and Reliability, Availability, and Maintainability (RAM) Growth. Government testing will begin in the Fall of 1979 with 35 flight hours during the PAE for early evaluation of aircraft flight characteristics and to verify that the available flight envelope is safe and adequate for further government testing. The icing test will be conducted during the winter of 1979 to provide data verifying the aircraft flight characteristics in icing conditions. The Design Verification testing, including aircraft performance, handling qualities, RAM characteristics, and interoperability requirements will begin in 1979 utilizing two aircraft for a total of 280 flight hours. The climatic hangar tests include 30 hours of extreme environmental testing to demonstrate the capability of the modernized CH-47 to meet stated specifications. A RAM growth test program is planned subsequent to DT/Operational Test (OT) II. A Production Validation Test (PVT) will be accomplished starting with production delivery.

2. Operational Test and Evaluation:

a. Operational Test II (OT II) will be independently conducted at Fort Campbell, Kentucky, by the US Army Operational Test and Evaluation Agency (OTEA). The test objectives include an assessment of the operational effectiveness of the modernized CH-47 (YCH-47D) to include improvements in RAM characteristics and logistical support. The test will address the adequacy of the proposed training for flight crews and maintenance personnel and the adequacy of doctrine and tactics. A total of 120 flight hours of OT II testing using the same two DT II prototypes is scheduled to be conducted in the spring of 1980. Two CH-47C helicopters will be used flying the same type missions and total flight hours to provide an additional basis for evaluating total

system improvements. Typical military user personnel will operate the aircraft and provide unit level maintenance. Intermediate level maintenance will be provided by the contractor. The aircraft will be essentially the same as the production model. The test will be conducted under simulated tactical conditions with tactical missions performed under day, night, and simulated instrument flight conditions. Typical loads will be transported externally, internally, and mixed external and internal.

b. The requirement for Follow-On Evaluation (FOE) tests will be determined by the Army Systems Acquisition Review Council/ Defense Systems Acquisition Review Council (ASARC/DSARC) III scheduled for August/September 1980.

3. System Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Max Gross Weight (lbs.)	50,000	To be determined through testing of prototype aircraft.
Max Cruise Speed (Kts.) 1/ (Design Gross Weight)	155	
Payload (ROC Mission) 2/ (lbs.)	15,775 3/	
Combat Radius (NM) 4/ (ROC Mission)	30	
Service Ceiling (ft.) (Design Gross Weight, One Engine Inoperative)	10,000	
Hardware Systems Reliability (MTBF) 5/ (hours)	3.0*	
Systems Operational Reliability (MTBF) (hours)	1.4*	

* Objective projected at maturity (100,000 fleet hours). Reliability values to be demonstrated prior to production decision ASARC/DSARC III are 1.52 and .76, respectively.

1/ Kts-Knots
2/ Required Operational Capability (ROC) Mission: External cargo, 4000 ft/95°F, hover-out-of-ground effect with 200 fpm vertical rate of climb at maximum power, 30 minute fuel reserve.
3/ The ROC requirement is 15,000 pounds.
4/ NM-Nautical Miles.
5/ MTBF-Mean Time Between Failures.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.17.A
DoD Mission Area: #441 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5671	4590	1198	6660	Continuing	Not Applicable
D275	Synthetic Flight Training Systems	5671	4590	1198	6660	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops high fidelity operational flight, weapon, and mission helicopter simulators to support initial entry rotary wing training, transition training, and combat operational training. The goal is to produce a simulation of the combat environment, to include tactical flight, weapons engagement, and enemy interaction, in order to provide realistic and cost effective training. The simulations are used to complement the training accomplished in the actual helicopters in the maintenance of combat readiness.

C. BASIS FOR FY 1980 RDTE REQUEST: Complete testing and type classify UH-60 flight simulator.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE Funds (as shown in FY 1979 submission)	5671	4590	13497	Continuing	Not Applicable

Reduction in FY 1980 estimate is due to elimination of AH-64 flight simulator FY 1980 funding in order to finance higher priority programs.

Program Element: #6.42.17.A
DoD Mission Area: #441 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements)	0	29800	16800	65100	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	29800	62200	-	Continuing	Not Applicable
Quantities (current requirements)	0	1 (CH-47) 2 (AH-1)	2 (CH-47)	2 (CH-47) 2 (AH-1) 2 (UH-60)	Continuing	Not Applicable
Quantities (as shown in FY 1979 submission)	0	1 (CH-47) 2 (AH-1)	2 (CH-47) 2 (AH-1) 3 (UH-60)	-		
Military Construction, Army						
Funds (current requirements)	0	2800	3500	10200	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	1660	8896	-		

Reduction in FY 1980 Aircraft Procurement, Army estimate is due to elimination of FY 1980 procurement of UH-60 and AH-1 flight simulators, based on actual development schedules. Increase in FY 1979 Military Construction, Army estimate is due to revised estimate for CH-47 flight simulator building in Germany, based on larger building size requirement and less favorable foreign exchange rates. Reduction in FY 1980 Military Construction, Army estimate is due to revised building schedule associated with elimination of FY 1980 AH-1S flight simulator procurement.

Program Element: #6.42.17.A
DoD Mission Area: #441 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This project develops a family of high fidelity flight, weapons, and mission helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operation training. A major thrust is the development of a simulation of the combat environment, including tactical flight, weapons engagement, and enemy interaction, to provide realistic and cost effective training in a totally safe environment. The simulators complement the training accomplished in actual helicopters in the maintenance of combat readiness. Each simulator includes a replica of the helicopter cockpit, mounted on a motion system, plus an instructor's station with the equipment necessary for the instructor to control the training scenario, the operating environment, and the measurement of the pilot's performance. Each simulator includes a visual system to provide the aircrew a view of the terrain outside the helicopter. The CH-47 flight simulator uses a closed circuit television camera which moves across a three-dimensional terrain model board in response to the pilot's control inputs. The AH-1 flight and weapons simulator, using a camera model board visual system similar to that of the CH-47 flight simulator but with two 48 by 36 degree windows instead of one, has the capability to simulate the firing of all the COBRA weapon systems. The UH-60 flight simulator which will replicate the flight performance of the UH-60A BLACKHAWK helicopter, now being introduced into the Army inventory, will have one cockpit equipped with a camera model board visual system and the other with a computer generated imagery (CGI) visual system. During testing the training transfer of the two visual systems will be evaluated. The impact of CGI is dramatic. Not only will operating cost be less, but the gaming area will be expanded from 96 square miles to 1600 square miles with the capability of producing enemy interaction. The AH-64 flight and weapons simulator will be the first of the devices to be a combat mission simulator.

G. RELATED ACTIVITIES: Program Elements 6.32.16.A, Synthetic Flight Simulators; 6.22.09, Aeronautical Technology; and 6.27.27.A, Non-Systems Training Device Technology. These activities are engaged in flight simulation component research and the development of simulators used for aeronautical engineering and training research.

H. WORK PERFORMED BY: Link Division, The Singer Company, Binghamton, NY, and Sunnyvale, CA. The responsible developing agency is the US Army Project Manager for Training Devices, colocated with the US Naval Training Equipment Center, Orlando, FL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The first simulator developed under this program was an instrument flight and emergency simulator modeled after the UH-1 helicopter. Development was completed in FY 1972. Production is now complete and 22 of these simulators are in service at 17 locations, worldwide. The second simulator provides transition and combat readiness flight training for pilots of the CH-47 helicopter. This simulator underwent development and operational testing in FY 1977 and demonstrated a cumulative transfer effectiveness ratio (CTER) of .85 to 1. In FY 1978 the CH-47 flight simulator was type classified. Production of five follow-on units will begin in FY 1979. The third simulator, replicating the AH-1 helicopter, has been in development since FY 1974. The UH-60 flight simulator entered development in FY 1977.

Program Element: #6.42.17.A
DoD Mission Area: #441 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Complete testing and type classify the AH-1 flight and weapons simulator. Deliver the UH-60 flight simulator for testing.

3. FY 1980 Planned Program: Complete testing and type classify UH-60 flight simulator.

4. FY 1981 Planned Program: Initiate development of the AH-64 combat mission simulator. In concert with the user, formalize the requirement for the Advanced Scout Helicopter (ASH) combat mission simulator.

5. Program to Completion: This is a continuing program. Complete development of AH-64 combat mission simulator. Conduct development testing and operational testing and type classify system. Develop and test ASH combat mission simulator. Develop and test cockpit and emergency procedures trainers for AH-64 and ASH.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.18.A
DoD Mission Area: #441 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	497	652	950	2404	Continuing	Not Applicable
D279	Airdrop Equipment Development	497	652	950	2404	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element (PE) supports engineering development and type classification of airdrop components and systems used by all Services for airborne assault, clandestine, and special operations and airdrop resupply of both conventional and airborne forces. The airdrop projects are included in the Army (US Army Training and Doctrine Command (TRADOC)) critical category priority list and directly support combat operations. The PE directly supports the 18th Airborne Corps "D" Package, the vanguard of almost every contingency, civilian and military, and thus vital to National Defense. Through data exchange agreements; standardization working groups; and Rationalization, Standardization, and Interoperability (RSI) programs, the PE fulfills essential airdrop mission needs of many allied countries.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue development of Type V airdrop platform for use with all delivery aircraft, including C-130, C-141, C-5A, C-14, and C-15. Complete certification of all Army critical loads for Low Altitude Parachute Extraction System (LAPES) mode of airdrop. Complete the development of rigging procedures for operationally critical munitions. Initiate development of Two-Staged Personnel Parachute System with accompanying loads for airdrop at high speeds and low altitude. Continue development of Maneuverable Reserve Parachute for Free-Fall Airdrop System. Initiate development of 500 pound capacity High Altitude Airdrop Resupply System (300 meters) for clandestine and special operations. Initiate task to provide airdrop engineering support for airtransportable and airdroppable Army materiel.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission) (Under PE 6.42.04.A)	578	645	950	Continuing	Not Applicable

Program Element: #6.42.18.A
DoD Mission Area: #441 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

The FY 1978 and FY 1979 differences reflect general adjustments to the program during execution. The decrease in FY 1978 represents a deemphasis of this project in favor of other higher priority projects. The increase in FY 1979 reflects a recoupment of dollars lost in FY 1978. FY 1980 is unchanged.

E. OTHER APPROPRIATION FUNDS: Not Applicable. (NOTE: Airdrop items are stock fund procured and managed.)

Program Element: #6.42.18.A
DoD Mission Area: #441 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The work under this program element (PE) was formerly under PE 6.42.04.A, Air Mobility Support Equipment. The objectives of this ongoing work are to develop and field airdrop systems, components, and techniques which will increase the mission capabilities of airdrop operations, reduce operational costs, increase reliability of airdrop operations, and improve the readiness posture of airborne and airlift forces. The program supports Army, Marine Corps, Air Force, Navy, and Allied Forces (as requested). The major efforts through Fiscal Year 1981 are focused on: providing a single platform for the delivery of all heavy drop loads, high level airdrop resupply capability, rigging procedures to ready units for airdropping selected munitions and Low Altitude Parachute Extraction System(LAPES) loads, new methods for enhancing the link-up of men and materiel after airdrop, engineering support to Air Force aircraft and Army materiel developers; improving the personnel reserve parachute and extending capability to airdrop personnel at higher speeds and lower altitudes; and enhancing the capability to airdrop from high performance aircraft.

G. RELATED ACTIVITIES: PE's 6.22.10.A, Airdrop Technology; and 6.32.18.A, Airdrop Equipment and Techniques; Joint Technical Coordinating Group/Airdrop; Joint Air Movements Board; North Atlantic Treaty Organization (NATO) Air Transport Working Party; Air Standardization Coordinating Group, Working Party 44; Mutual Weapons Data Exchange Agreements with France and Germany.

H. WORK PERFORMED BY: Brooks and Perkins, Inc., Livonia, MI; Metric Systems, Inc., Ft. Walton Beach, FL; Pioneer Parachute Co., Manchester, CT; Irvin Industries Ltd, Canada; ParaFlite, Inc., Pennsauken, NJ; Georgia Technology Research Institute, Atlanta, GA; Arthur D. Little, Jr., Cambridge, MA; US Army Yuma Proving Ground, Yuma, AZ; US Army Natick Research and Development Command, Natick, MA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Seventeen airdrop end items were fielded during the past five years, including cargo extraction parachute, steerable free-fall parachute assembly, and DRAGON missile jump pack. Contract awarded for the design and fabrication of test quantities of Type V platform; fifty equipment and supply loads qualified for LAPES delivery; procured and completed development and operational testing (DT II/OT II) of altitude sensors for high altitude airdrop resupply system (HAARS); developed rigging procedures and qualified 60 items of selected munitions for airdrop; designed and fabricated quantities of the "wedge" bundle unloading device for concept evaluation.

2. FY 1979 Program: Continue development of Type V airdrop platform; develop rigging procedures for additional fifteen selected loads for LAPES delivery; type classify 2000 pound capacity high altitude airdrop resupply system (HAARS) and transition to appropriate Readiness Command; complete study of REDEYE and STINGER missiles to determine design parameters for parachutist jump packs; continue development of rigging procedures for selected munitions; initiate development of maneuverable reserve parachute (free-fall); complete testing of the "wedge" bundle unloading device and type classify for use with C-130 aircraft.

Program Element: #6.42.18.A
DoD Mission Area: #441 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Initiate development and operational tests (DT II/OT II) of Type V airdrop platform; complete developing procedures for the final ten loads for LAPES delivery; initiate design of 500 pound capacity high altitude airdrop system (HAARS); complete design and fabricate test quantities of REDEYE missile jump packs; complete development of rigging procedures for selected munitions and publish results in FM 10-553 for field use; initiate the development of a computer model to simulate loading of Army materiel in transport aircraft; initiate development of two-staged personnel airdrop system; complete engineering design and development testing (DT II) of maneuverable reserve parachute (free-fall).

4. FY 1981 Planned Program: Complete engineering test of Type V airdrop platform, type classify and plan for initial production buy; initiate development and operational testing (DT II/OT II) of 500 pound capacity high altitude airdrop system; complete development of REDEYE missile jump pack and type classify; complete design of STINGER missile jump pack; continue work on computer model for loading Army Materiel in airtransport aircraft; design and fabricate test quantities of two-stage personnel airdrop system and initiate development testing; initiate operational test (OT II) of maneuverable reserve parachute (free-fall); initiate development of ground assembly aids and award contract for off-the-shelf hardware to obtain near-term improved capability for rapid assembly after airdrop; initiate development of ultra-heavy airdrop system and award contracts for the design of system components; complete development testing of CTU/2A high speed container airdrop system and type classify.

5. Program to Completion: *This is a continuing program.*

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6 43.06.A
Title: STINGER
DoD Mission Area: #414 - Field Army Air Defense
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11956	24582	17577	5384	0	200213
	QUANTITIES (Missiles)						208
D646	STINGER	11956	24582	17577	5384	0	200213

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for full scale development of a Manportable Air Defense Weapon System (MANPADS). MANPADS is a self-defense air defense weapon system needed to counter enemy low altitude, high-speed tactical aircraft and helicopter threats to company size units operating near the Forward Edge of the Battle Area (FEBA). STINGER has been designed as the MANPADS to replace the current REDEYE system, which has no forward aspect engagement capability and no Identify-Friend-Foe (IFF) system. Engineering Development (ED) of the basic STINGER system was completed with FY 1978 funds. An advanced seeker, Passive Optical Seeker Technique (POST), is now in engineering development.

C. BASIS FOR FY 1980 RDTE REQUEST: The programed full scale development of the advanced seeker (POST) will be in the third year. Extensive captive ground and flight testing will be performed on the block one design in preparation for the thirteen guided test vehicle testing which will be initiated and completed. Computer tolerance studies, pre-flight, and post-flight computer studies and the validation of the computer simulation will be performed. The design of the tracking head trainers will be performed and the fabrication of the trainers will be initiated. Targets for the flight test program will be procured. Continuing efforts are: fabrication of hardware for support of the various test activities, preparation of the Technical Data Package, and Producibility Engineering Planning activities.

Program Element: #6.43.06.A
DoD Mission Area: #414 - Field Army Air Defense

Title: STINGER
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiation of ED of the POST Seeker	June 1977	June 1977
Completion of ED of POST Seeker	June 1981*	January 1981
Seeker available in Europe		

*Changes in milestone dates occurred because of design difficulties associated with incorporating microprocessor signal processing and with the packaging and partitioning of the electronics within weight and space limitations.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	11957	24582	17576	5385	200230

Reason for change: The minor differences in costs reflect refined cost estimates.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Missile Procurement, Army*						
Funds (current requirements)	34000	104900	81000	84800	741200	1045900
Funds (as shown in FY 1979 submission)	34000	104900	79300	--	894100	1112400
Quantities (current requirements)	258	2250	2400	2400	23145	30453
Quantities (as shown in FY 1979 submission)	258	2250	2400	--	25545	30453

Program Element: #6.43.06.A
DoD Mission Area: #414 - Field Army Air Defense

Title: STINGER
Budget Activity: #4 - Tactical Programs

*NOTE: Procurement fund total includes programed phase-in of the POST Seeker into STINGER production beginning in FY 1981. An estimated 7,050 Basic STINGER missiles will be provided prior to POST phase-in with the remaining 23,403 to be equipped with POST Seekers. Basic STINGER missiles initially fielded will replace the obsolete REDEYE's with US Forces in Europe. These REDEYE assets may eventually be used for training requirements. Procurement strategy for missiles equipped with the POST Seeker will be competitive if possible. Present POST program is considered a very conservative estimate of total cost and continues to be analyzed. Strategy is to be finalized in 1981. The quantities of missiles remain the same for the FY79 submission. Funding profiles reflect revised cost estimates.

Program Element: #6.43.06.A Title: STINGER
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The currently fielded REDEYE Guided Missile System exhibits serious limitations in view of the current and postulated threat posed by enemy support and interdiction jet aircraft. REDEYE can attack only receding aircraft flying at speeds less than knots and is vulnerable to a variety of infrared countermeasures. Furthermore, REDEYE has no IFF capability. The purpose of this program is to produce, test, and field STINGER as the successor to REDEYE and to develop, test, and field the follow-on STINGER-POST Seeker with improved counter-countermeasures to meet advanced countermeasures threats. As a successor to REDEYE, STINGER will overcome the above cited deficiencies by being capable of engaging threat aircraft from any aspect at speeds up to knots with no more than a degradation due to all known infrared countermeasures. STINGER will complement PATRIOT, ROLAND, and DIVAD GUN in air defense of the field Army. STINGER will be deployed with both Army and Marine Corps forward combat elements and is expected to replace REDEYE generally on a one-for-one basis. STINGER is similar to REDEYE in that it is a shoulder-fired, passive infrared homing guided missile system. STINGER has a higher performance rocket motor, an advanced seeker, a separable reusable gripstock, a new launcher, and a lightweight Identification Friend or Foe (IFF) device. The total weight of the missile and its launcher in the ready-to-fire configuration is 33.9 pounds. The fire unit is a two-man team and is authorized a basic load of six missiles with six additional missiles in theater stocks. The advanced seeker (POST) has demonstrated feasibility of a two color (infrared and ultraviolet) design which is highly immune to countermeasures. Full scale development of POST began in FY 1977.

G. RELATED ACTIVITIES: This program is a joint development with the United States Marine Corps. Production requirements for that service are fully coordinated with the Army.

H. WORK PERFORMED BY: Development of the STINGER Basic System and the POST seeker is under the direction of the US Army Missile Research and Development Command, Huntsville, AL. The prime contractor is the Pomona Division of General Dynamics, Pomona, CA. Atlantic Research Corporation, Gainesville, VA, is the developer of the rocket motor. Other Government agencies which will contribute during the development phase are the US Army Armament Research and Development Command, Dover, NJ, (missile warhead), and the US Army Electronics Research and Development Command, Fort Monmouth, NJ, (battery).

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: In 1965, a series of advanced development efforts were begun to demonstrate the critical components required for an improved, shoulder-fired air defense missile which would engage low flying aircraft from any engagement aspect flying at speeds up to knots. The effort demonstrated through firings at jet aircraft targets that such components were feasible. In June 1972, STINGER entered formal Engineering Development. The Baseline design was completed in 1974. A cost reduction effort titled STINGTHRIFT was completed resulting in an estimated $29 million savings in procurement. In FY 1975, the Guided Test Vehicle (GTV) series of tests were completed with positive indications of system performance criteria being met. A total of 16 GTV firings conducted demonstrated 75 percent success rate against threat representative targets. A design flight test program (18 rounds) was conducted to confirm parameters. Producibility Engineering Planning (PEP) was initiated which provided delivery of Special Acceptance Inspection Equipment and drawings for the Initial Production Facilities

(IPF). In FY 1976 and FY 1977, further tests continued with the Prototype Qualification Tests-Contractor (PQT-C). These flights determined that the contractor met his contract specifications. The government initiated Prototype Qualification Test-Government (PQT-G) to evaluate system performance independently against requirements. There were 35 flights conducted in Prototype Qualification Test-Government (PQT-G) under varying environmental conditions. The US Army Operational Test and Evaluation Agency (OTEA) also tested the system (Operational Test II) with both non-firing tactical exercises and troops firing a total of 11 rounds. An 18 round Production Prototype Test initiated in July 1977 was successfully completed in November 1977. STINGER artic testing by US Army Test and Evaluation Command (TECOM) was completed in February 1978, and Producibility Engineering Planning (PEP) was essentially completed in September 1978. A production Technical Data Package (TDP) adequate to support initial production was completed in December 1977. This production TDP consists of documentation defining the product (tactical system and ancillary equipment), Special Acceptance Inspection Equipment (SAIE), operation methods planning data and tooling design. SAIE to support production of the Warhead Section was completed in July 1978. STINGER Initial Production was begun in April 1978. A counter-countermeasures improved seeker (POST) full scale development effort was initiated 28 June 1977, after affirmative Army Systems Acquisition Review Council (ASARC) and Office of the Secretary of Defense (OSD) decisions. The development program culminates in FY 1981 at the completion of a 29-round flight test and the TDP.

2. FY 1979 Program: POST Development will be continued. The major part of the design for the final configuration will be completed. Engineering Evaluation Testing (EET) will be initiated. Fabrication of the first flight configuration hardware will be initiated as design trade-off studies and a preliminary performance assessment are completed. Fabrication and ground and laboratory testing of prototype hardware will be continuing as will Producibility Engineering Planning (PEP) activities. Target purchases will be made in preparation for the FY 1980 flight test program.

3. FY 1980 Planned Program: POST Engineering Development will continue with similar engineering tasks as FY 1979 with increased emphasis on PEP efforts but reduced expenditures for target support. Detailed computer kinematic and tolerance studies will be completed. Pre- and post-flight computer analyses will be initiated in support of 13 guided test vehicle (GTV) firings which will be conducted. Extensive ground and laboratory testing to proof the design will be performed prior to and in conjunction with the GTV phase of the firing effort. Design of Tracking Head Trainers (THT) will be initiated and completed, and fabrication started.

4. FY 1981 Planned Program: Completion of Engineering Development of the POST will be accomplished in FY 1981. System simulation actitives will include: (1) completion of computer simulation validation and pre- and post-flight analyses; and (2) initiation and completion of the computer final performance assessment. All development activities will be completed and the program concluded at the end of the flight test effort and the delivery of the Technical Data Package (TDP). Tests, test support, and PEP will also be completed.

5. Program to Completion. Program will be completed in FY 1981.

gram Element: 06.43.06.A
DoD Mission Area: 0414 - Field Army Air Defense

Title: STINGER
Budget Activity: 04 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Development Contractor - General Dynamics, Pomona, CA.

b. Development Test and Evaluation (DT&E) has been completed for Basic STINGER; no significant deficiencies were noted, and the system has proceeded into production. The required system round reliability was and the demonstrated reliability was This high reliability supports the planned certified round maintenance concept. DT&E for STINGER-POST started in FY 1978 and is scheduled for completion in FY 1981.

c. Basic STINGER completed the following testing:

Type of Test	Number of Missiles Fired	Test Date
(1) Contractor Development Testing	59	Nov 73 - Sep 76
(2) Government Verification Testing	75	Oct 76 - Feb 78

Technical problems were experienced in guidance and propulsion sections and corrected with a revised configuration during early contractor tests (the Guided Test Vehicle series). Weapon performance was demonstrated during the Design Flight series of contractor tests but manufacturing process (quality control) problems caused termination of initial Prototype Qualification Tests - Contractor (PQT-C). Following corrective action, the PQT-C program was successfully completed. Total system performance was demonstrated by the government during Development Test (DT) II. Eighteen additional Production Prototype Test (PPT) rounds were fired by the government to confirm the production configuration resulting from the Government prototype qualification tests. The PPT configuration is in production. Arctic testing uncovered a quality problem in the connector between the warhead and guidance sections. This has been corrected and the connector strengthened for production.

d. DT&E for STINGER-POST includes a comprehensive program of ground test, simulation and flight testing. Ground testing includes the recently completed fly-by and sweep tests for tracking, counter-countermeasures, and terminal guidance data. Environmental testing will be conducted on piece parts, assemblies, and the total STINGER-POST weapon to establish design adequacy and environmental performance. Extensive reliability testing will be performed at over-stress levels to determine the design margin of the STINGER-POST hardware. Performance assessments using a flight-test validated computer simulation will evaluate the hardware design and establish the STINGER-POST performance capabilities and lethality against the full range of threat speeds, maneuvers, and countermeasures. The 29 flight tests planned for the STINGER-POST program will be conducted to verify performance against various targets and provide the required data to validate the system simulation.

2. Operational Test and Evaluation:

a. Operational Test and Evaluation (OT&E) for Basic STINGER has been completed; no significant deficiencies were noted and the system has proceeded into production.

b. Operational Test I was not conducted. Instead US Army Operational Test and Evaluation Agency (OTEA) monitored the contractor demonstration at Ft. Bliss, TX during Mar-Jun 75. The contractor demonstration showed the capability of STINGER in the areas of human factors, weapon performance effectiveness, preliminary weapon system reaction times and associated command, control, and communications doctrine.

c. Operational Test II (OT II) for Basic STINGER was performed by the OTEA in Aug 76 for the field exercise portion and Oct 76 for the live firing portion of the test. The STINGER Weapon System was evaluated during OT II in terms of performance of the REDEYE Weapon System, which was used as the baseline. The conclusions that supported a production decision with hardware configuration tested are:

(1) The STINGER Weapon System has a substantial forward hemisphere capability which can engage targets from all aspects. REDEYE engages targets in an outgoing or crossover aspect only.

(2) Functional operations of the STINGER Weapon System are basically the same as those of the REDEYE Weapon System. STINGER operator errors, when they occur, are similar to those made by REDEYE operators.

(3) STINGER possesses an Identification Friend or Foe (IFF) system which is adequate when used as an aid for identification. REDEYE does not have an IFF capability.

(4) Infrared countermeasures are [illegible] against the STINGER Weapon System than against the REDEYE Weapon System. However, STINGER can still be

d. The OT&E requirements for gunner-fired STINGER-POST weapons are planned to be integrated into the total DT&E flight tests of 29 missiles. A separate operational field exercise using trainers will be conducted to assess the prelaunch or gunner influenced performance of the system. While the external appearance and gunner mechanical operations are not changed from the Basic STINGER system, this STINGER-POST tracking exercise will evaluate gunner training and operational aspects of the system.

3. Systems Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Maximum Target Speed		
Maximum Intercept Range		
Intercept Altitude (Min/Max) (In Meters)		
Weapon Reliability		
Weight	34.5 lbs	33.9 lbs
Infrared Countermeasures (IRCM) 1/		
IFF MARK XII 2/		

1/ Maximum overall system performance degradation in a countermeasures environment.
2/ Maximum range at which operator may challenge aircraft.
3/

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.07.A
DoD Mission Area: #414 - Field Army Air Defense

Title: PATRIOT (SAM-D)
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	214427	228392	128718	31668	1900	1812450
	QUANTITIES						
D212	PATRIOT (SAM-D)	214427	227492	125718	26668	0	1801650
D291	PATRIOT (NATO)	0	900	3000	5000	1900	10800

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: PATRIOT (Project Number D212) will replace NIKE HERCULES and Improved HAWK. Deployment of the PATRIOT system will significantly reduce manpower and logistical costs and provide an improved Army air defense. In the field Army, PATRIOT defenses will be complemented by short range, low altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. The advanced features of PATRIOT will provide an increased capability against saturation attacks, electronic countermeasures (ECM), and maneuvering targets. PATRIOT is an advanced surface-to-air guided missile system with a high single shot kill probability capable of operation in an ECM environment, and able to conduct multiple simultaneous engagements against the high performance air-breathing targets (ABT) likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat, PATRIOT will utilize a trainable, multifunction, electronically-scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance (track-via-missile (TVM)) systems. PATRIOT (Project Number D291) is being considered by European nations as their future surface-to-air missile system. The US is participating in a NATO Study Group considering US PATRIOT as a replacement for NATO Improved HAWK class systems. Six European NATO nations have indicated their intent to enter with the US into a full-time, two-year program beginning in November 1978 to plan for the acquisition of PATRIOT by the European Signatory Nations.

Program Element: #6.43.07.A
DoD Mission Area: #414 - Field Army Air Defense

Title: PATRIOT (SAM-D)
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: Flight test (22) Modular Digital Airborne Guidance Section (MDAGS) missiles for Development Test/Operational Test II (DT/OT II). Firing Unit (FU) #3 and #5 will be used to support the flight tests; FU #5 will also undergo environmental and system interoperability tests; and FU #4 will undergo climatic tests. Development activities in the Antiarm area will continue toward demonstration of this capability. Producibility Engineering and Planning (PEP) activities conclude with the completion of the manufacturing data package, completion of the design and documentation of the special tooling and special test equipment. The second Initial Production Facility (IPF) contract will be executed to buy the special tooling and special test equipment to complete the production line set up for producing the PATRIOT tactical hardware. The first production buy of PATRIOT tactical hardware will be executed after the Defense System Acquisition Review Council (DSARC) III decision in April 1980. Project D291, PATRIOT (NATO), will support US participation in NATO Groups considering PATRIOT as the future European surface-to-air missile replacement system.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
First Modular Digital Airborne Guidance System (MDAGS) Flight	Oct 78	Oct 78
Delivery of FU #3 to White Sands Missile Range (WSMR)	Dec 78	Sep 78
Delivery of FU #4 to WSMR	Jan 79	Jan 79
Contractor Flight Tests Completed and Start of DT/OT II Testing	Jul 79	Jul 79
Completion of DT/OT Testing	Mar 80*	May 80

* Testing will be completed in March 1980 in time for DSARC III although final reports will not be published until May 1980.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979	216423	228392	122218	24668	1797518

Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

In November 1978, the US and four other NATO nations signed a Memorandum of Understanding which established a NATO PATRIOT Management Group in Europe to Conduct a two year study to determine the preferred acquisition option for PATRIOT by our NATO allies. The increase in PATRIOT (NATO) (D291) for FY 1980 would fund the United States' portion of this NATO effort.

E. OTHER APPROPRIATIONS FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirement)	0	67321	425950	419788	2781341	3694400*
Funds (as shown in FY 1979 submission)	0	67321	428112	-	3928800	4424100*
Quantities (current requirement)						
Fire Control Sections (FCS)	0	0	5	15	83	103
Missiles	0	0	155	184	3934	4273
Quantities (as shown in FY 1979 submission)						
FCS	0	0	5	-	128	133
Missiles	0	0	155	-	5492	5647
Military Construction, Army						
Funds (current requirement)	0	0	0	11400	0	11400
Funds (as shown in FY 1979	0	0	0	-	11400	11400

* Does not include Initial Provisioning Spares.

Program Element: #6.43.07.A
DoD Mission Area: #414 - Field Army Air Defense

Title: PATRIOT (SAM-D)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: PATRIOT will replace NIKE HERCULES and Improved HAWK. Deployment of the PATRIOT system will significantly reduce manpower and logistical costs and provide an improved Army air defense. In the field Army, PATRIOT defenses will be complemented by short range, low altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. The advanced features of PATRIOT will provide an increased capability against saturation attacks, electronic countermeasures (ECM), and maneuvering targets. PATRIOT is an advanced surface-to-air guided missile system with a high single shot kill probability capable of operation in an ECM environment, and able to conduct multiple simultaneous engagements against the high performance air-breathing targets (ABT) likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat, PATRIOT will utilize a trainable multifunction, electronically-scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance (track-via-missile (TVM)) systems.

G. RELATED ACTIVITIES: System commonality with the Navy AEGIS has been studied and although separate developments are required, continuous coordination insures the use of common components, whenever feasible. The PATRIOT system, through the Battalion, will be interoperable with other Army Group/Brigade level command and control systems through the Army Air Defense Command and Control System (AN-TSQ-73). It will also be interoperable with the Air Force or Marine systems when the Group/Brigade level AN/TSQ-73 is not available.

H. WORK PERFORMED BY: The Raytheon Company at Bedford, MA, is prime contractor with Martin-Marietta Corporation of Orlando, FL, as missile subcontractor. Thiokol Chemical Corporation of Huntsville, AL, is a subcontractor for the rocket motor. IBM Corporation of Huntsville, AL, is the System Engineering Cost Reduction Assistance Contractor (SECRAC). Teledyne Brown, Huntsville, AL, is the Software Verification and Validation contractor; Science Applications Incorporated, Huntsville, Al, has developed a Tactical Operation Simulator (TOS), Sanders Associates, Nashua, NH, is developing an Operator/Tactics Trainer (OTT). Government Agency in-house work is managed by the PATRIOT Project Management Office, Huntsville, AL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The project was initiated as the Army Air Defense System for the 1970's (AADS-70's) in 1963. The program was reoriented and renamed SAM-D in FY 1965. Contract Definition was completed and a contract for Advanced Development (AD) was awarded in May 1967. SAM-D hardware was designed, fabricated and tested. The Advanced Development program proved the ability of the multifunction phased array radar to carry out time-shared search and track functions under computer control. As a result of the successful completion of Advanced Development objectives, PATRIOT (formerly SAM-D) was approved for entry into Engineering Development (ED) in March 1972. The SAM-D Nuclear and Antimissile Capability Study was approved in December 1972. This study recommended: (1) deletion of the nuclear warhead; (2) programing of reduced number of fire sections for Continental United States (CONUS) air defense; and (3) development of an improved nonnuclear warhead. The program was reoriented on 10 January 1974 to emphasize greater austerity while permitting early flight verification of the track-via-missile

guidance principle. A stop work order was issued to the prime contractor on 4 February 1974. As a result of this order, all effort in support of a major portion of the hardware development and some engineering activities were deferred until a Defense System Acquisition Review Council (DSARC) met to approve the reoriented program. On-going efforts remaining after the stop work order were in support of the TVM demonstration and an austere development program. The DSARC met on 6 June 1974 to review the reoriented program. In accordance with the Deputy Secretary of Defense directive, based on the DSARC recommendations, program efforts continued in the following areas: (1) preparation for the track-via-missile (TVM) demonstration flights; (2) continuation of the austere development program; (3) initiation of cost reduction; and (4) development of a backup guidance. The final Control Test Vehicle (CTV) flight was completed on 28 August 1974. Of the 10 flights, were rated as success with full accomplishment of flight objectives. The major objectives of the captive carry flight test program, a prerequisite to the Engineering Development Model (EDM) #1 flight, were successfully demonstrated and repeated during November 1974. Proof-of-Principle flight tests demonstrated through missile firings that TVM guidance functions successfully against benign targets which are maneuvering in formation and at low altitudes. consecutive successful flight tests proved the principle of track-via-missile; the remaining missiles were used to obtain additional engineering data. An Army System Acquisition Review Council (ASARC)/DSARC was held in January 1976 which allowed the resumption of full-scale Engineering Development. The Surface-to-Air Missile Development (SAM-D) program was officially named PATRIOT on 21 May 1976. On 4 August 1976, a contract to complete the contractor portion of the PATRIOT system development was awarded to Raytheon Company, the Prime Contractor. The PATRIOT Missile System Flight program was resumed on 2 December 1976 at White Sands Missile Range (WSMR) with the firing of EDM-15 using the tactical prototype Fire Unit (FU-1). A special ASARC held in February 1977 approved the Accelerated Program. A total of seven of flight tests and twenty-four search/track tests were successfully conducted using FU-1. One flight test was scored a partial success due to a software logic error. Tactical prototype Fire Unit number 2 was delivered to WSMR on 1 July 1977. At the end of June 1978, nine flight tests had been conducted using FU-2. were successful and were no-test. On 22 June 1978, the Project Manager suspended the Regular Airborne Guidance Section (RAGS) missile firing program to allow optimum preparation time for the initiation of the Modular Airborne Guidance Section (MDAGS) flights and to provide time to assess and resolve the recent system reliability problems associated with RAGS flights. The RAGS flight program was continued on 31 August 1978 with the successful conduct of EDM flight 33. The MDAGS flight program was initiated on 28 September 1978 with the successful firing of EDM 34 which was a control test vehicle mission to evaluate MDAGS control capability. Producibility Engineering and Planning (PEP) activities were initiated in October 1977. These activities will develop the manufacturing data package, design the special tooling and special test equipment, and develop the quality assurance plans necessary to go into production. Initial Production Facilities (IPF) plans were developed and the first IPF Request for Proposal (RFP) was issued to Raytheon.

2. FY 1979 Program: With the successful accomplishment of a multiple simultaneous engagement on 4 October 1978, the RAGS flight test program was terminated. Fourteen MDAGS will be fired with four being fired from FU 2 and the remainder to be fired from FU 3 and 5. FU 3 will be shipped to WSMR for use in the flight test program. FU 5 will undergo limited climatic testing at Contractor's plant prior to shipment to WSMR where it will be used to support the WSMR test program. FU 4 will begin environmental qualification in FY79. The Command and Control Set (CCS) will complete fabrication and assembly and will be delivered to

White Sands Missile Range (WSMR). Three Modular Airborne Guidance Section (MDAGS) missiles will be flight tested as Development Test II begins in FY 1979. Producibility Engineering and Planning (PEP) activities will continue during this fiscal year. The first Initial Production Facilities (IPF) contract will be executed to purchase the long lead special tooling and special tooling and special test equipment necessary to support a production decision on the PATRIOT Program in FY 1980.

3. FY 1980 Planned Program: Twenty-two MDAGS missiles are scheduled to be flight tested to complete Development Test/ Operational Test II (DT/OT II). The environmental qualification program is scheduled for completion. Development activities in the area of Antiarm will continue. PEP activities conclude with the completion of the manufacturing data package, completion of the design and documentation of the special tooling and special test equipment. The second IPF contract will be executed to buy the special tooling and special test equipment ot complete the production line set up for initial production of the PATRIOT tactical hardware at less than full-scale production rate. The first production buy of PATRIOT tactical hardware will be executed after the Defense System Acquisition Review Council (DSARC) III decision in March 1980.

4. FY 1981 Planned Program: Fire Unit #3, 4, & 5 will be retrofitted to accommodate the peculiar requirements of the Antenna Mast Group and ARM programs. Battalion training will be initiated using FU #4 & 5. The third IPF contract will be executed to procure the special tooling and special test equipment necessary to meet the full-scale production rates of PATRIOT. The second production contract for PATRIOT tactical hardware will be executed.

5. Program to Completion: Effort will be expended in the following areas: Battalion Training; Production Confirmatory Testing; Fielding of Battalions; and Follow-On-Evaluation.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D212 Title: PATRIOT (SAM-D)
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: PATRIOT (Project Number D212) will replace NIKE HERCULES and Improved HAWK. Deployment of the PATRIOT system will significantly reduce manpower and logistical costs and provide an improved Army air defense. In the field Army, PATRIOT defenses will be complemented by short range, low altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. The advanced features of PATRIOT will provide an increased capability against saturation attacks, electronics countermeasures (ECM), and maneuvering targets. PATRIOT is an advanced surface-to-air guided missile system with a high single shot kill probability capable of operation in an ECM environment, and able to conduct multiple simultaneous engagements against the high performance air-breathing targets (ABT) likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat, PATRIOT will utilize a trainable, multifunction, electronically-scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance (track-via-missile-TVM) systems. PATRIOT (Project Number D291) is being considered by European nations as their future surface-to-air missile system. The US is participating in a NATO Study Group considering PATRIOT as a replacement for NATO Improved HAWK class systems. Six European NATO nations have entered with the US into a full-time, two-year program beginning in November 1978 to plan for the acquisition of PATRIOT by the European Signatory Nations.

B. RELATED ACTIVITIES: System commonality with the Navy AEGIS has been studied and although separate developments are required, continuous coordination insures the use of common components whenever feasible. The PATRIOT system, through the Battalion, will be interoperable with other Army Group/Brigade level command and control systems through the Army Air Defense Command and Control System (AN/TSQ-73). It will also be interoperable with the Air Force or Marine systems when the Group/Brigade level AN/TSQ-73 is not available.

C. WORK PERFORMED BY: The Raytheon Company at Bedford, MA, is prime contractor with Martin-Marietta Corporation of Orlando, FL, as missile subcontractor. Thiokol Chemical Corporation of Huntsville, AL, is a subcontractor for the rocket motor. IBM Corporation of Huntsville, AL, is the System Engineering Cost Reduction Assistance Contractor (SECRAC). Teledyne Brown, Huntsville, AL, is the Software Verification and Validation contractor; Science Applications Incorporated, Huntsville, AL, has developed a Tactical Operation Simulator (TOS); Sanders Associates, Nashua, NH, is developing an Operator/Tactics Trainer (OTT). Government agency in-house work is managed by the PATRIOT Project Management Office, Huntsville, AL.

Project: #D212 Title: PATRIOT (SAM-D)
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The project was initiated as the Army Air Defense System for the 1970's (AADS-70's) in 1963. The program was reoriented and renamed SAM-D in FY 1965. Contract definition was completed and a contract for Advanced Development (AD) was awarded in May 1967. SAM-D hardware was designed, fabricated, and tested. As a result of the successful completion of Advanced Development objectives, PATRIOT (formerly SAM-D) was approved for entry into Engineering Development (ED) in March 1972. The SAM-D Nuclear and Antimissile Capability Study was approved in December 1972. This study recommended: (1) deletion of the nuclear warhead; (2) programing of reduced number of fire sections for Continental United States (CONUS) air defense; and (3) development of an improved nonnuclear warhead. The program was reoriented on 10 January 1974 to emphasize greater austerity while permitting early flight verification of the track-via-missile (TVM) guidance principle. A stop work order was issued to the prime contractor on 4 February 1974. As a result of this order, all effort in support of a major portion of the hardware development and some engineering activities were deferred until a Defense Systems Acquisition Review Council (DSARC) met to approve the reoriented program. Ongoing efforts remaining after the stop work order were in support of the TVM demonstration and an austere development program. The DSARC met on 6 June 1974 to review the reoriented program. In accordance with the Deputy Secretary of Defense directive, based on the DSARC recommendations, program efforts continued in the following areas: (1) preparation for the TVM demonstration flights; (2) continuation of the austere development program; (3) initiation of cost reduction; and (4) development of a backup guidance. The final Control Test Vehicle (CTV) flight was completed on 28 August 1974. Of the 10 flights, 9 were rated as successes with full accomplishment of flight objectives. The major objectives of the captive carry flight test program, a prerequisite to the Engineering Development Missile (EDM) #1 flight, were successfully demonstrated and repeated during November 1974. Proof-of-Principle flight tests demonstrated through missile firings that TVM guidance functions successfully against benign targets which are maneuvering in formation and at low altitudes. Six consecutive successful flight tests proved the principle of track-via-missile; the remaining missiles were used to obtain additional engineering data. An Army Systems Acquisition Review Council (ASARC)/DSARC was held in January 1976 which allowed the resumption of full-scale Engineering Development. The Surface-to-Air Missile Development (SAM-D) program was officially named PATRIOT on 21 May 1976. On 4 August 1976, a contract to complete the contractor portion of the PATRIOT system development was awarded to Raytheon Company, the Prime Contractor. The PATRIOT Missile System Flight program was resumed on 2 December 1976 at White Sands Missile Range (WSMR) with the firing of Engineering Development Model (EDM-15) using the tactical prototype Fire Unit (FU-1). A special ASARC held in February 1977 approved the Accelerated Program. A total of of eight flight tests and twenty-four search/track tests were successfully conducted using the tactical prototype Fire Unit (FU-1). One flight test was scored a partial success due to a software logic error. Tactical prototype Fire Unit number 2 was delivered to WSMR on 1 July 1977. At the end of June 1978, nine flight tests had been conducted using FU-2. were successful and were no-test. On 22 June 1978, the Project Manager suspended the Regular Airborne Guidance Section (RAGS) missile firing program to allow optimum preparation time for the initiation of the Modular Airborne Guidance Section (MDAGS) flights and to provide time to assess and resolve the recent system reliability problems associated with RAGS flights. The RAGS flight program was continued on 31 August 1978 with

the successful conduct of Engineering Development Missile (EDM) flight 33. The Modular Airborne Guidance Section (MDAGS) flight program was initiated on 28 September 1978 with the successful firing of EDM 34 which was a control test vehicle type of mission to evaluate MDAGS control capability. Producibility Engineering and Planning (PEP) activities were initiated in October 1977. These activities will develop the manufacturing data package, design the special tooling and special test equipment, and develop the quality assurance plans necessary to go into production. Initial Production Facilities (IPF) plans were developed and the first IPF Request for Proposal (RFP) was issued to Raytheon.

2. FY 1979 Program: With the successful accomplishments of a multiple simultaneous engagement on 4 October 1978, the Regular Airborne Guidance Section (RAGS) flight test program was terminated. Fourteen MDAGS will be fired with four being fired from FU-2 and the remainder to be fired from FU-3 and 5. FU-3 will be shipped to White Sands Missile Range (WSMR) for use in the flight test program. FU-5 will undergo limited climatic testing at Contractor's plant prior to shipment to WSMR where it will be used to support the WSMR test program. FU-4 will begin environmental qualification in FY 1979. The Command and Control Set (C&S) will complete fabrication and assembly and will be delivered to WSMR. Three MDAGS missiles will be flight tested as Development Test II begins in FY 1979. PEP activities will continue during this fiscal year. The first IPF contract will be executed to purchase the long lead special tooling and special test equipment necessary to support a production decision on the PATRIOT

rogram in FY 1980.

3. FY 1980 Planned Program: Twenty-two MDAGS missiles are scheduled to be flight tested to complete Development Test II/ Operational Test II (DT/OT II). The environmental qualification program is scheduled for completion. Development activities in the area of Anti-Arm will continue. PEP activities conclude with the completion of the manufacturing data package, completion of the design and documentation of the special tooling and special test equipment. The second IPF contract will be executed to buy the special tooling and special test equipment to complete the production line set up for initial production of the PATRIOT tactical hardware at less than full-scale production rate. The first production buy of PATRIOT tactical hardware will be executed after the Defense Systems Acquisition Review Council (DSARC) III decision in March 1980.

4. FY 1981 Planned Program: FU-3, 4, and 5 will be retrofitted to accommodate the peculiar requirements of the Antenna Mast Group and ARM programs. Battalion training will be initiated using FU-4 and 5. The third IPF contract will be executed to procure the special tooling and special test equipment necessary to meet the full-scale production rates of PATRIOT. The second production contract for PATRIOT tactical hardware will be executed.

5. Program to Completion: Effort will be expended in the following areas: battalion training; production confirmatory testing; fielding of battalions; follow-on evaluation.

Project: #D212 Title: PATRIOT (SAM-D)
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
First Modular Digital Airborne Guidance System (MDAGS) Flight	Oct 78	Oct 78
Delivery of FU-3 to White Sands Missile Range (WSMR)	Dec 78	Sep 78
Delivery of FU-5 to WSMR	Jan 79	Jan 79
Contractor Flight Tests Completed and Start of Development Test/ Operational Test (DT/OT)	Jul 79	Jul 79
Completion of DT/OT Testing	Mar 80	May 80

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
PATRIOT (SAM-D) D212						
Funds (current requirements)	214427	227492 1/	125718 2/	26668 2/	0	1801650
Funds (as shown in FY 1979 submission)	216423	227492	122218	Not Shown	24668	1796618
Quantities (current requirements)						Not Applicable
Quantities (as shown in FY 1979 submission)						Not Applicable

1/ Adjustment due to revision of cost estimates.
2/ Increase due to netting requirements identified by the Defense Science Board.

Project: #D212 Title: PATRIOT (SAM-D)
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

Other Appropriation Funds:

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	67321	440650 1/	439288	2859341	3806600 1/
Funds (as shown in FY 1979 submission)	0	67321	428112	Not Shown	3928800	4424100
Quantities (current requirements)						
Fire Control Section (FCS)	0	0	5	15	83	103 2/
Missiles	0	0	155	184	3897	4236 2/
Quantities (as shown in FY 1979 submission)						
Fire Control Sections (FCS)	0	0	5	Not Shown	128	133
Missiles	0	0	155	Not Shown	5492	5647
Military Construction, Army:						
Funds (current requirements)	0	0	0	11400	0	11400
Funds (as shown in FY 1979 submission)	0	0	0	Not Shown	11400	11400

1/ Current requirement varies from FY79 submission because of adjustments in initial provisioning of spares and cost escalation.
2/ Total program procurement quantity adjusted for planning purposes pending NATO assessment of planning schedules for Improved HAWK replacement.

Project: #D212 Title: PATRIOT (SAM-D)
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

E. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. The Initial Advanced Development (AD) contract was awarded to Raytheon Company of Bedford, MA, in May 1967. As a result of the successful AD program, on 31 March 1972 the Deputy Secretary of Defense approved PATRIOT entry into engineering development (ED) and a contract was executed. The ED program was interrupted in January 1974 to demonstrate the Track-Via-Missile (TVM) guidance concept through the Proof-Of-Principle firing program.

b. Phase I system demonstration firings were initiated by the contractor in February 1975. This firing phase, comprised of missiles, demonstrated Proof-Of-Principle of the Track-Via-Missile guidance, the guidance modes, and fuzing functions. As a prerequisite to the live firings, Captive Carry Flight Tests were conducted. These tests used an abbreviated missile (without rocket motor) mounted on an aircraft to simulate the free space guidance conditions of a missile intercepting a target. Due to the outstanding success of the missile firings, the Department of Defense objectives of Proof-Of-Principle demonstration were met with the first PATRIOT guided missile flights against target aircraft. The target conditions included additional engineering evaluation firings were performed against targets of An additional missiles were fired as control test vehicles to complete the matrix of missile aerodynamic data. of the missile flights were successful. No major deficiencies were discovered during this phase and at the conclusion of Proof-Of-Principle firings, full Engineering Development status was restored.

c. During Phase II tests, the contractor demonstrated system performance against various electronic countermeasures. An extensive search/track test program was conducted to exercise the system against various electronic countermeasures (ECM) and target scenarios. These tests included were employed. Target conditions included Most tests included up to stand-off jammers radiating barrage noise. In addition, the data from these tests were used to evaluate system

diagnostic capabilities, built-in test equipment (BITE), reliability, availability, and maintainability (RAM), system status monitor and the adequacy of system displays and controls. Eight (8) missile firings were successfully conducted against targets of various intercept geometries in the presence of Multiple simultaneous engagements were performed to demonstrate the capability to control multiple missiles in terminal guidance while simultaneously conducting surveillance functions. The final Phase II firing test was conducted in November 1977 with Fire Unit Number 2. As in Phase I, the Phase II firing test revealed no major deficiencies; minor adjustments to equipment were made as required. The results of these tests have met all Army requirements for the system at this stage of development.

d. Phase III tests are continuing through July 1979. They consist of missile flights in electronic countermeasures (ECM) environments in addition to system environmental and battalion tests. missiles are scheduled to be fired by the Contractor by July 1979 and an additional by the Government to complete the Protype Qualification Tests (PQT) firing program during June 1979 to March 1980. Environmental tests are being performed to determine the effects of natural and induced environments. This testing includes mobility, transportability, chemical, biological, climatic, altitude, electromagnetic radiation and electromagnetic pulse environments. Tests will be performed utilizing a battalion minus to demonstrate that system requirements have been met, evaluate troop proficiency and demonstrate the system's capability in a variety of deployments and environments. Prototype Qualification Tests by the Government (PQT-G) will measure the technical performance of the system and determine the degree to which the performance meets stated specifications or characteristics. Military personnel are being incorporated into the program to assess these critical man-machine interfaces. The Government will monitor and participate in the Contractor Prototype Qualification Testing (PQT-C) to satisfy as many PQT-G requirements as practicable to preclude duplicative testing. PQT-C and Operational Test (OT) II evaluators will also share equipment and test data for independent evaluation.

e. Reliability and Maintainability data has been collected on PATRIOT firing units since early in Engineering Development (ED) beginning with factory integration testing and continuing with systems testing at White Sands Missile Range, NM. As a result of this process, reliability and maintainability problems were identified early and corrective actions have been incorporated in the later ED firing units. The PATRIOT firing units are expected to demonstrate satisfactory growth toward specified Mean Time Between Failure values during the government Prototype Qualification Tests.

2. Operational Test and Evaluation:

a. The US Army Operational Testing and Evaluation Agency (OTEA) will schedule and conduct Operational Test II (OT II) during July 1979 to March 1980, an operational climate test (OCT) in Oct-Dec 1980, and a Follow-On-Evaluation (FOE) during 1981-1983. Ground equipment used for OT II will be common to that used for Development Test (DT) II. Nine of twenty-five Government test missiles are designated to be fired under the control of OTEA. An independent evaluation will be provided by OTEA at the decision

reviews prior to the production decision. OT II will be conducted at White Sands Missile Range (WSMR) and Ft Bliss, TX, on prototype equipment manned by user troops. These troops will be trained by the contractor for two to four months before the tests. Since the production decision will be made after DT/OT II, logistic support and training activities have been expanded so that the evaluation will better support a production decision.

b. The FOE will be conducted in two phases. Phase I will be at Fort Bliss, TX, during the last sixty (60) days of Unit Training of the 1st Battlation to be deployed. Phase II will be conducted at the deployed location five (5) months after deployment.

c. Of the five individual fire units built during Enginerring Development, fire unit (FU) #1 was constructed in a non-mobile configuration. The radar antenna and the launcher were installed in fixed positions at WSMR. Communications and coordination data were exchanged by cables between the equipment elements. Fire Unit #2 was the first mobile fire unit. The radar and launcher were rotatable on their separate trailers and the control station equipment was in a van much like the final tactical design will be. Communications and coordination data were still by wire between elements. Fire Units 3, 4, and 5 are essentially in a tactical configuration as the production units will be. Communication by radio data link will be effected for the tests with these units. Beside their severe individual tests, Fire Unit #3 and Fire Unit #5 will participate in tests of the battalion command and coordination capability by exchanging data and receiving tactical directions from the battalion unit by tactical digital radio signals. These tests are designed to exercise the full range of battalion tactical requirements. In addition, Fire Unit #4 is designated to undergo severe climatic testing, mobility testing and chemical biological testing at Eglin AFB, FL, and Aberdeen Proving Ground, MD. These tests of production-like equipment will provide the data for a production decision in April 1980.

3. Systems Characteristics:

MATERIAL CONTAINED IN THIS SECTION EXCEEDS THE MAXIMUM ALLOWABLE CLASSIFICATION OF THIS DOCUMENT

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.08.A
DoD Mission Area: #413 - Fire Support

Title: Precision Laser Designator
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4091	9193	3600	0	0	48518
	QUANTITIES						22
D075	Ground Laser Locator Designator (GLLD)	4091	8693	3600	0	0	45967
DF30	Protective Laser Devices	0	500	0	0	0	2551

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for the development of a precision laser designator to be used in either a ground tripod or vehicular mounted configuration. The GLLD provides the capability for long range precision designation of either stationary or moving tank sized targets to allow a high probability of a first round kill with laser guided weapons such as the cannon launched guided projectile - COPPERHEAD and the heliborne missile - HELLFIRE, and determination of the target bearing and range relative to the GLLD to enhance conventional artillery effectiveness against stationary or moving targets. There is no ground laser designator in the operational inventory that can be used with precision laser guided ordnance. COPPERHEAD and HELLFIRE are dependent on the GLLD for operational employment. A previous project within the program was for the development of protective laser devices to enhance designator and operator survivability.

C. BASIS FOR FY 1980 RDTE REQUEST: FY80 will complete remaining development tasks in the GLLD program. Effort will be to complete design documentation and logistics data for Development Test/Operational Test (DT/OT) deficiencies and shortcomings, conduct testing in reduced visibility areas, complete Technical Data Package (TDP) for Special Acceptance Inspection Equipment (SAIE) and support equipment, complete logistics engineering and maintain engineering development (ED) hardware in current status to support tri-service weapons testing.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Development Test/Operational Test II	Dec 78	Apr 78
Production Decision	Jan 78	Jan 78
Contract Award	Mar 78	Mar 78

Program Element: #6.43.08.A
DoD Mission Area: #413 - Fire Support

Title: Precision Laser Designator
Budget Activity: #4 - Tactical Programs

Development Test/Operational Test (DT/OT) II schedule was revised due to technical difficulties, which resulted in slippage of reliability and environmental portion of DT. OT II was delayed due to availability of COPPERHEAD munitions. The technical difficulties have been corrected.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1977	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE						
Funds (as shown in FY 1979 submission)	6350	4091	12593	4400	0	52,469

FY79 was reduced due to congressional action. The FY80 reduction is due to protective laser devices funding no longer being requested. The requested funds provide for all activities planned to complete the development of the GLLD.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:						
Funds (current requirements)	0	26500	26500	34700	83500	170500
Funds (as shown in FY 1979 submission)	0	26500	16800	-	66700	110000
Quantities (current requirements)	0	130	208	312	710	1390*
Quantities (as shown in FY 1979 submission)	0	130	222	-	923	1275

* Plus 989 beyond FY84.

FY80 request was increased to provide sufficient quantities for concurrent COPPERHEAD and GLLD deployment. Funding is based upon increased experience gained from first procurement of another laser system.

Program Element: #6.43.08.A
DoD Mission Area: #413 - Fire Support

Title: Precision Laser Designator
Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: This program element was initiated in FY 1974 to provide for engineering development of precision laser designators to be used in conjunction with laser guided weapons of all services. The Ground Laser Locator Designator (GLLD) consists of a laser designator/rangefinder, tracking unit, and mount. It also has an interface for mounting the TOW night sight (AN/TAS-4). The system weighs 52 pounds, less night sight, determines target bearing, designates moving targets visible through the optics, and ranges to targets. The primary user of the GLLD is the artillery forward observer. The system is capable of operating in a vehicular mounted configuration. A previous project to develop protective laser devices to enhance operator and designator survivability has been terminated. In response to congressional concerns on laser designator duplication, the Department of Defense will report to the House Appropriations Committee during February/March 1979.

G. RELATED ACTIVITIES: The US Navy, US Air Force, and US Marine Corps use the same technologies in their laser homing weapon system programs. There is close coordination between the services, which includes technology working groups and tri-service agreements to provide exchange of technology efforts, to allow use of common components or equipments, where practical, and to insure system compatibility in the field. The Army has been designated the lead service for the development of all ground laser designators. Army experimental ground laser designators have supported live firings of the Navy's 8-inch guided projectile program, the Navy's BULLDOG Missile, the Air Force Close Air Support Missile, and the Army's HELLFIRE and COPPERHEAD programs. The US Army Missile Research and Development Command has developed and is procuring the Laser Target Designator (LTD) and is developing the Modular Universal Laser Equipment (MULE) for the US Marine Corps under Program Element 6.47.65.M. The MULE is a tripod mounted version of the LTD equipped with a rangefinder. The MULE utilizes a very high level of component commonality with the Army's LTD, AN/GVS-5 rangefinder and GLLD. The Air Force has selected the LTD for its interim designator requirement for tactical air control parties.

H. WORK PERFORMED BY: In-house work is performed by the US Army Missile Research and Development Command, Redstone Arsenal, AL. The contractor for engineering development of the GLLD is Hughes Aircraft Company, Culver City, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The first GLLD engineering development unit was delivered in December 1976 by Hughes. Subsequently, 22 GLLD systems, 4 trainers, ground support equipment including repair parts, and most manuals underwent engineering tests at MIRADCOM and at the contractor's facility to demonstrate readiness for formal Development Test/Operational Test (DT/OT) II. Formal DT/OT II is approximately 95 percent complete. Performance of the Hughes GLLD system satisfies its Required Operational Capability (ROC) requirements. A vehicle adaption kit program for the GLLD was initiated in FY75. Adaption kits for the M113 and M151 have been built and supported the GLLD DT/OT II test program. Testing of the vehicle mount concept at MIRADCOM shows that the GLLD system performance on stationary vehicles is essentially the same as the ground mount.

2. FY 1979 Program: Engineering development units of the Ground Laser Locator Designator (GLLD) will be used to complete the Development Test/Operational Test (DT/OT) II testing. GLLD units will be used for additional compatibility testing with other systems. In-house effort is continuing in the area of contract and overall program management, reliability enhancement and production planning. Effort will be expanded to capitalize on technological advances in batteries, laser rods, optical coatings, etc. Support and investigation/correction of problems resulting from the use of GLLD in HELLFIRE and COPPERHEAD DT/OT testing in the FY79 timeframe.

3. FY 1980 Planned Program: The GLLD will enter production in FY79. Remaining GLLD development tasks will be completed in FY80. Funds are for completion of low priority tasks that do not restrict start of production, but are required for fielding of GLLD. Tasks include completion of producibility engineering for short lead time items such as support equipment and ancillary equipment; completion of contractor and in-house logistics support and materiel fielding tasks; refurbishment of engineering development (ED) prototype hardware for continued test support of COPPERHEAD, HELLFIRE and other tri-service users; and completion of technical data package for support equipment and in-house developments such as vehicle mounts and night sight integration. The FY80 effort will continue the enhancement of performance and reliability by capitalizing on the technological advances in batteries, laser rods, optics coatings, etc. Investigation and correction of problems identified in related systems testing (DT/OT II, DT/OT III) of HELLFIRE and COPPERHEAD will be conducted in the FY79 and FY80 timeframe.

4. FY 1981 Planned Program: Not Applicable.

5. Program to Completion: Not Applicable.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.09.A
DoD Mission Area: #414 - Field Army Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	75403	22663	11299	6999	0	288400
	QUANTITY - Fire Units						4
	QUANTITY - Missiles						90
D647	ROLAND	75403	22663	11299	6999		288400

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the transfer of the design of the French/German ROLAND II All-Weather Short Range Air Defense (SHORAD) Missile System to the US. A US ROLAND II System has been fabricated for testing. Subsequently, a US production base will produce US ROLAND II Systems for use to meet the all-weather SHORAD missile requirement. This system is required to fill the Army's need for an all-weather Short Range Air Defense System to defend vital targets in Corps areas against low flying high speed aircraft.

C. BASIS FOR FY 1980 RDTE REQUEST: $11.3 million in FY 1980 is needed to complete the technology transfer, test and evaluation. This includes completion of: (1) data analysis of environmental test results, (2) final test reports, (3) final Program Management Reports and Logistics Effort, and (4) development and test of the US CRG 2000 ECCM modification. The design of the US ROLAND Classroom Trainer will also be initiated.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Defense System Acquisition Review Council I/II	FEB 74	FEB 74
Source Selection Evaluation	JAN 75	JAN 75
Joint US/European Test (Completed)	NOV 78	NOV 78
Defense System Acquisition Review Council III	MAY 79	SEP 78

Program Element: #6.43.09.A
DoD Mission Area: #414 - Field Army Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: (Cont)

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Low Rate Production	MAY /9	OCT 78
Initial Operational Capability (Training Btry)		

All changes in milestone dates result from slippage due to Congressional actions and budget cuts requiring program restructuring.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)	75403	22663	6218	0	276246

In FY 1980, additional funding is required to fund CRG 2000 ECCM modification and to begin design of a DA recognized TRADOC requirement for a Classroom Trainer.

Program Element: #6.43.09.A
DoD Mission Area: #414 - Field Army Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	55700	167600	296900	520600	980500	2021300 1/
Funds (as shown in FY 1979 submission)	55700	202738	213900	-	1180400	1652643
Quantity - Fire Units:						
(current requirements)	0	3	18	54	105	180 2/
(as shown in FY 1979 submission)	0	15	20	-	145	180
Quantity - Missiles:						
(current requirements)	0	75	410	970	4731	6186 2/
(as shown in FY 1979 submission)	0	314	500	-	5372	6186

NOTES:

1/ Procurement funding reflects the purchase of ROLAND fire units and equipment including initial spares for nondivisional air defense.

2/ Total authorized acquisition objective for the Army (less TTF&T Fire Units).

Funding and quantity changes between the FY 1980 and the FY 1979 submissions are directly due to Congressional budget actions. There was an intervening program of 6FUs/155Msls due to restructure of program due to increased cost of FY78-79 IPF/ES. This required readjustment in the funding levels from FY 1981 on. The quantities of hardware cut in FY 1979 will be purchased in the outyears, assuming that the total Army Authorization Objectives (AAO) for missiles and fire units will be procured.

Program Element: #6.43.09.A Title: ROLAND

DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is to transfer technology and fabricate hardware for the conduct of engineering development tests on a US-built ROLAND air defense system. The US ROLAND System will provide an all-weather surface-to-air missile capability for use in defense of airbases and other rear area critical assets. The US ROLAND II Fire Units will replace the presently deployed European nondivisional CHAPPARAL/VULCAN Units. The US ROLAND System consists of a Fire Unit Module (two missile launchers, internal missile storage compartment for 8 missiles, acquisition and tracking radar, and other fire control equipment) mounted on a single XM975 Tracked Vehicle. The US ROLAND II System will engage low flying targets at ranges up to 6 km and altitudes up to 5 km. The US ROLAND missile may be launched in the optical mode (without using the tracking radar) or in the tracking radar mode for an all-weather capability. At intercept, warhead detonation can be initiated by either a

G. RELATED ACTIVITIES: Evaluations to verify the technical performance of three foreign developed air defense systems (the German/French ROLAND II, the United Kingdom RAPIER, and the French CROTALE) were conducted under Project 0699 (Evaluations of Foreign Weapon Systems) of Program Element 6.33.01.A (Advanced Forward Area Air Defense Systems). Close liaison is maintained with the development/production efforts of the French/German ROLAND II program. The development program for the US ROLAND conforms to the provisions of specific license agreements and Memoranda of Understanding which closely control the configuration, joint test management and international interchangeability. The Joint Roland Control Committee (JRCC) was organized to administer these provisions.

H. WORK PERFORMED BY: The program is managed by the US Army Missile Research and Development Command (MIRADCOM), Huntsville, AL. The prime contractor is Hughes Aircraft Company, Canoga Park, CA. Boeing Aerospace Company, Seattle, WA, is the major subcontractor. Hughes Aircraft Company and Boeing Aerospace Company are the US Co-Licensees for Euromissile, the European consortium responsible for the European ROLAND II System.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Short Range Air Defense (SHORAD) Requirements Study concluded that a requirement existed for an all-weather low altitude air defense system. This requirement was approved by the Army Staff in August 1973. The SHORAD Missile Program was approved by the Defense System Acquisition Review Council (DSARC) in February 1974. Four contractors responded to the Army's request for proposals: (1) Philco-Ford for the all-weather CHAPPARAL missile system; (2) Rockwell International for the CROTALE missile system; (3) United Aircraft for the RAPIER system; and (4) Hughes Aircraft Company for the ROLAND II System. A Cooperative Test Program was initiated in 1975 with the German Government. This test was designed to reduce the terminal and schedule risk of the engineering development phase of the program. In August 1975 the Army's contractor (Hughes Aircraft Company) projected a cost growth in the technology transfer, fabrication, and test contract. A special Army Systems Acquisition Review Council (ASARC), on 17 October 1975, directed that the program be restructured to provide an opportunity for the European system design to stabilize and to provide an opportunity to reassess the Army's program. Hughes Aircraft Company

provided a revised cost proposal for a restructured contract modification. During FY 1976 the contractor's program was closely monitored by issuing funds in monthly incremental allotments sufficient to permit completion of the design transfer. Fabrication of electrical and mechanical subcomponents of the missile and fire units began. The Cooperative Test Program was completed in February 1976 at Patrick AFB, FL. During FY 1977 activities toward the fabrication of prototype US ROLAND II hardware continued and the first prototype US ROLAND II missile was completed. The restructured contract modification proposed by Hughes Aircraft Company was negotiated in August 1976 and a special ASARC was held on 16 September 1976. The ASARC recommended continuation of the program to a Special Defense System Acquisition Review Council (DSARC) which met on 24 September 1976. During FY 1977 and 1978 fabrication of 4 Fire Units and 90 Missiles to be used in testing was completed. A strike at the Boeing Aerospace Company, Seattle, WA, plant which lasted from 3 October 1977 to 17 November 1977 resulted in delays of prototype hardware delivery for the Test Program. Full system testing commenced in February 1978 with a coordinated operational and developmental test program. Design and fabrication of a US National Field Maintenance Test Set (FMTS) was initiated. Cooperative efforts on international interchangeability continue with over 500 field replaceable subassemblies already identified for approval by the Joint ROLAND Control Committee (German, France, and US). Initial Production Facilitization (IPF) funds were released in mid-FY 1978 by OSD. A major ECCM (CRG 2000) improvement, identified jointly by US and Europeans, has been applied to the missile and has been tested in flight. Additional effort is required on the track radar to complete the CRG 2000 improvement. An ASARC/DSARC production decision is planned for the second quarter of FY 1979 after the completion of a major portion of the testing. Joint testing in the US began in May 1978 at White Sands Missile Range, NM, to further supplement and complement US Army testing and to prove the concept of international interchangeability. Earlier tests had been conducted at the French range at CEL during FY 1978.

2. FY 1979 Program: Prototype qualification operational testing and environmental testing will be completed. Design of the track radar receiver to incorporate an ECCM modification (CRG 2000) will be initiated. Prototype Fire Units will be refurbished to an "as delivered" TTF&T configuration. Upon approval of the Defense System Acquisition Review Council (DSARC) III, initial production will be initiated in FY 1979. Training will begin for personnel to support the Initial Operational Capability (IOC).

3. FY 1980 Planned Program: Analyze data and conduct activities incident to the close-out of the technology transfer, continue design/testing of CRG 2000; initiate development/prototype fabrication of multistation classroom trainer.

4. FY 1981 Planned Program: Complete multistation Classroom Trainer, prepare for first operational capability in Oct 1981. Confirmatory Test begins in March 1981.

5. Program to Completion: This is a continuing program. Efforts continue to develop and fabricate Classroom Trainer. Production continues, aimed at deployment of the first tactical battalion to Europe in Units to complete the Corps deployment will be operational by the end of

Program Element: #6.43.09.A Title: ROLAND
DOD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. The US contractor is Hughes Aircraft Company, Canoga Park, CA.

b. The All Weather (AW) Short Range Air Defense (SHORAD) missile system is the US ROLAND air defense system developed jointly by Germany and France. ROLAND is in series production in Europe in a clear-weather version (ROLAND I) and in the all-weather version (ROLAND II). A US evaluation test of the US ROLAND was conducted in the US in early 1978. This test verified the ability of the system, with some modification, to meet the US AW SHORAD requirement. Major deficiencies found in the test program were: (1) These deficiencies have been quantified, and cooperative design effort is underway in Europe and the US to correct the deficiencies. (2) Missile failures occurred due to separation of missile fairings during flight tests. The design has been installed and flight tested with successful results. (3) Overall system reliability is less than desired. Action has been taken to increase system reliability to the desired level.

c. System integration testing on the first Development Test and Evaluation (DT&E) unit began at the contractor's plant in November 1977 and in January 1978 tracking and firing test began at White Sands Missile Range (WSMR) using the same unit. At the present there are four systems in DT&E, two at WSMR, NM (one for the conclusion of the tracking and firing program and one for environmental testing), and one at the contractor's plant in Seattle (one for Peculiar Support Equipment (PSE) integration/test) and one at the Cold Region Test Center for arctic testing . Fire units and missiles produced during the DT&E phase were fabricated using "build-to-print" philosophy. Since the advent of the DT&E program the US and European governments have agreed on common configuration control of more than 500 replaceable subassemblies. This program philosophy will assure minimum change from the DT&E units to the units procured in production. Certain changes will be made for producibility purposes or reliability and performance in procurements which will be coordinated with the Europeans and approved by the JRCC prior to implementation. Therefore, with the exception of performance changes jointly agreed to by the three governments, the US ROLAND production units will be very similar to the DT&E units. The US ROLAND DT&E program to date has completed 94 firings and 847 development acquisition/tracking missions and participated in 501 OT nonfire missions. The flight test results to date are flight tests without failures, flights with failures (were partially successful in that they provided sufficient test data to satisfy significant test objectives). The failures can be classified as due to start shortfalls in quality control and due to design deficiencies (of which three deficiencies accounted for of the failures) and one due to procedure. The quality control and design deficiencies have been identified, and the corrections proven by flight test. Design failures observed involved 3 missile fuze radomes, 8 missile fairings, one missile J-33 connector, one switching transient, and 2 missile hybrid circuits; all of these problems have been corrected and demonstrated during tests. Those remaining pertain to European missile hardware requiring unilateral correction and inherent design limitations. All subsystem qualification tests have been completed satisfactorily and the fire unit environmental tests are in progress. The system has successfully completed the roadability/transportability testing at Aberdeen Proving Ground (APG), MD, which involved approximately 1500 miles of road travel. Based on

the test results and analysis to date, the US ROLAND System with modifications is expected to meet the performance requirements set forth in the Required Operational Capability (ROC) document. Validation of the logistics concept is not planned until follow-on testing scheduled for FY81. The risk in this decision was recognized and approved in past Army/OSD reviews of the program as part of the Powers Test Review, which structured the test program for ROLAND. Sufficient reliability, availability and maintainability (RAM) data are being collected during the DT&E program to allow an accurate RAM assessment prior to Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III. As expected, some required improvements have been identified during testing and will be phased into the program after international interchangeability (I2) coordination has been achieved with the Europeans. None of the technical problems observed during Prototype Qualification testing - Government and contractor are severe enough to preclude a production decision in May 79. Only track radar modification associated with a major ECCM improvement (CRG 2000) will require retrofit of some of the LRP fire units. The fire units will be wired to accept the CRG 2000 modification, which will minimize the retrofit impact. A problem area which is still open involves
}including CRG 2000, which effect either the track radar or missile. Cooperative effort is underway in Europe and the US to correct the deficiencies and corrections will be verified during a special evaluation test scheduled in Mid CY80. Booster grain cracked during rail impact test which was caused by a tolerance problem in the thrust bearing plate between the booster aft end and the missile tube assembly. The design of the modifications is underway and will be verified during confirmatory testing scheduled in CY81. System reliability has been less than desired. Major contributors to this problem are the track radar, prime power unit (PPU), and environmental control unit (ECU). These subsystems will be modified to improve reliability. Track radar modifications will be tested during the special evaluation test. PPU and ECU modifications will be verified during confirmatory testing.

2. Operational Test and Evaluation: The US Army Operational Test and Evaluation Agency (OTEA) participated in the testing of the ROLAND II system during the cooperative tests in 1975. OTEA completed Operational Testing (OT II) in October 1978 and sufficient data was acquired by OT crews to allow an operational assessment prior to ASARC/DSARC III. During the recent OT II firing missions at WSMR, operational performance data as well as reliability, availability, and maintainability data were collected on 15 test firings. Operational effectiveness and RAM data were also acquired on 362 aircraft tracking passes conducted during the four 72-hour OT II nonfiring exercises at Vandenburg AFB, CA. Some organizational maintenance data was also collected utilizing military crews during this phase of testing. The Operational Test and Evaluation Agency and the Test and Evaluation Command will conduct follow-on (confirmatory) tests scheduled for FY81. Military crews will be used to perform follow-on test operations - operator and maintenance.

Program Element: #6.43.09.A
DOD Mission Area: #414 - Field Army Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

3. System Characterisitics:

Operational/Technical Characteristics	Objective	Demonstrated Performance
(a) Forward Intercept Range		
Maximum (KM)		
Minimum (M)		
(b) Side Intercept Range		
Maximum (KM)		
Minimum (M)		
(c) Intercept Altitude		
Maximum (KM)		
Minimum (M)		
(d) System Reaction Time (Sec)		
(e) Reload Time (Sec)		
(f) System Operational Availability (A_O)		
(g) System Operational Effectiveness (E_{SO})		
Benign (non-ECM) non-maneuvering, single target		
Benign (non-ECM) maneurvering, single target		
Benign (non-ECM) multiple target formation		

Program Element: #6.43.09.A
DOD Mission Area: #414 - Field Army Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

Operational/Technical Characteristics	Objective	Demonstrated Performance
ECM environment, non-maneuvering, single target		
ECM environment, multiple target formation		
(h) Arm Survivability		
(i) Missile Reliability		
(j) Inherent Availability (A_I)		
(k) Target Speed		
Maximum (MPS)		
Minimum (MPS)		
(l) Engagement Target Maneuvers (g's)		

NOTES:
1. *Demonstrated performance based on current PQT-C/G/OT test scoring and/or additional simulation/preliminary scoring with failures purged based on current hardware configuration.
2. In cases where demonstrated RAM performance has not achieved the Army's objectives, updates can be expected as technical deficiencies are corrected, system improvements demonstrated and additional testing is completed.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	52382	65058	58000	38616	18708	286869
	QUANTITIES						229
0074	Heliborne Missile - HELLFIRE	52382	65058	58000	38616	18708	286869

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: HELLFIRE is a heliborne antiarmor terminal homing modular missile system which uses a shaped charge warhead to defeat individual hardpoint targets with minimal exposure of the delivery vehicle to enemy fire. HELLFIRE will initially utilize semiactive laser terminal homing guidance and will be designed to accept various other guidance packages. The missile system will be employed from Advanced Attack Helicopters (YAH-64's) against heavily armored vehicles at longer stand-off ranges and with greater lethality than missiles currently in the inventory. HELLFIRE will provide accurate fire on targets acquired and autonomously designated by the attack helicopter or remotely designated by ground observers, other attack helicopters, and aerial scout helicopters. HELLFIRE can be employed in a wide variety of firing modes in day or night operations. It is being developed to meet the armored vehicle and other hardpoint target threats of the timeframe.

C. BASIS FOR FY 1980 RDTE REQUEST: The HELLFIRE Modular Missile System prime contractor will continue engineering development activities including design, fabrication, and testing. Tactical missile prototype flight tests and system qualification tests will be completed. Operational tests using an AH-1 (COBRA) test bed helicopter will be conducted and Phase I of operational tests on the Advanced Attack Helicopter will be initiated. Producibility Engineering and Planning (PEP), environmental storage tests, and low cost seeker delivery and testing will be continued. In addition, the system prime contractor will support the Advanced Attack Helicopter (YAH-64) in preparation for operational tests. Significant contractor planned accomplishments are functional and physical configuration audits and release and approval of the technical data package. Army effort will include operational testing and preparation for and conduct of Defense System Acquisition Review Council (DSARC) III for the start of production. Precontract award activities will be accomplished for a production contract award early in FY 1981.

Program Element: #6.43.10.A
DOD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army System Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/ DSARC II)	Feb 76	Feb 76
Engineering Development (ED) Contract Award	Oct 76	Oct 76
Operational Test (OT) II Start	Oct 79	Oct 79
ASARC/DSARC III	Apr 80	Apr 80
Low Rate Initial Production (LRIP) Contract Award	Oct 80	Oct 80
ASARC/DSARC IIIA	Nov 81	Nov 81
Missile & Launcher Availability		
Initial Operational Capability (IOC) on Advanced Attack Helicopter (AAH)		

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	50482	65058	64586	47615	281846
Quantities					241

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

The FY 1978 program was increased $1.9M by a reprograming action to support the low cost seeker effort. The FY 1980 estimate was reduced to accommodate schedule changes within the Engineering Development contract and the amount reduced was shifted into FY 1981 and FY 1982. The reduction from 241 to 229 missiles is due to the deletion of 12 missiles previously scheduled for the Advanced Scout Helicopter program.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	0	-	27677	499682	527359
Funds (as shown in FY 1979 submission)	0	0	14743	-	506642	521385
Quantities (current requirements)	0	0	0	600		
Quantities (as shown in FY 1979 submission)	0	0	0	-		

Funding change between the FY 1979 and FY 1980 submission (9905) is due to application of revised inflation guidance and to a reduction of FY 1980 procurement funds to zero with FY 1981 being increased $11.1M.

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program began with exploratory development in laser guidance. Previous work by the Army, Navy, and Air Force established the technical feasibility of using lasers to designate targets for terminal homing of laser seeker equipped ordnance. The Army conducted a successful prototype flight test program using the Air Force HORNET missile modified with laser terminal homing capabilities. The flight tests reduced the developmental risk and demonstrated the feasibility of helicopter launched laser guided missiles. During exploratory flight tests, fifty-six missiles were fired from ground and aerial launch platforms using ground and airborne designation. Competitive Advanced Development (AD) contracts for system design concepts were awarded to Hughes Aircraft Company and Rockwell International Corporation in June 1974. In October 1976 Rockwell was selected as the prime contractor for Engineering Development (ED). Earlier in 1974 the Air Force was designated by the Department of Defense as the executive agent for the Tri-Service Laser Seeker. An Air Force contract was awarded for the Engineering Development of seekers to be used on the Air Force Maverick Missile and the Army's HELLFIRE missile. Due to the projected high production cost of this Tri-Service Seeker, the Army and Air Force are pursuing a joint cost reduction effort for the Tri-Service Seeker. In addition, the Army initiated a low cost seeker program with Martin-Marietta Corporation to provide competition in the seeker development with the purpose of reducing production seeker costs. In November 1978, the Army selected the Martin-Marietta seeker to be used for missile system qualification and cancelled the Army requirement for the Rockwell developmental prototypes. HELLFIRE will be effective against targets at ranges up to in the direct fire mode and to in the indirect mode. The longer stand-off range and the ability of the helicopters to mask behind terrain features provide a significant increase in helicopter survivability over antiarmor helicopters currently in the inventory. The 7-inch diameter missile will weigh 95 pounds, penetrate a minimum of and be capable of defeating potential enemy tanks of the timeframe. This system will provide the Army with a common missile airframe capable of accepting a family of terminal homing seeker modules to engage a variety of targets. The initial seeker module will be a laser seeker which provides the capability to deliver accurate fire on hard point targets which have been designated by a laser designator. Other seeker modules may include a "fire and forget" infrared seeker and an air defense suppression seeker.

G. RELATED ACTIVITIES: The HELLFIRE Missile System is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination is effected through technology coordination groups, frequent liaison visits, exchange of components and subsystems, and exchanges of analyses, simulation, and hardware test results. The exploratory prototype program was conducted under Program Element (PE) 6.23.03.A, Missile Technology, and the Advanced Development effort was conducted under PE 6.33.10.A, Heliborne Missile - HELLFIRE. Work on the Infrared Seeker will be done under PE 6.43.16.A, Fire and Forget Seeker, HELLFIRE currently programed for funding in FY 1980. The Air Defense Suppression System (ADSS) development is programed for funding under PE 6.33.07.A, Heliborne Air Defense Suppression System, in FY 1981. The US Air Force portion of the Tri-Service development is funded under PE 6.46.08.F, Close Air Support Weapon Systems. The Air Force has elected not to employ the Tri-Service Laser Seeker on the Maverick Missile. The Advanced Attack Helicopter is funded under PE 6.42.07.A.

H. WORK PERFORMED BY: Contractors are Rockwell International Corporation, Columbus, OH, and Anaheim, CA; and Martin-Marietta Corporation, Orlando, FL.

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Exploratory development work commenced in FY 1971. The FY 1972 program initiated concept formulation activities. This effort included work on fire control integration, laser measurements, countermeasure investigations, and warhead design. Exploratory flight tests were conducted with [redacted] field of view seekers to obtain information on the achievability of terminal and designator tracking accuracy. The funding provided exploratory configuration hardware for operational tests. The FY 1973 program provided for completion of a cost effectiveness study, and two phases of Military Potential Tests (MPT). These efforts were designed to provide a basis for a decision to enter full-scale development of a laser guided missile in FY 1974. The results from the MPT and Cost and Operational Effectiveness Analysis, however, revealed some operational uncertainties that warranted further investigation. Consequently, during the 3d quarter of FY 1974 it was decided to retain the laser missile program in Advanced Development (AD) for two more years. These uncertainties were resolved in further exploratory tests. Rockwell International Corporation and Hughes Aircraft Company were selected in 1974 to continue development of modular missile technology for eventual competitive selection of one Engineering Development (ED) contractor. Efforts during FY 1974 included follow-on technical tests, field tests, and extensive use of simulation to resolve the operational questions. Additional firings using the earlier experimental hardware were accomplished at Redstone Arsenal, AL. The two contractors were awarded contracts to conduct HELLFIRE Modularity/Verification Flight Tests. Because of FY 1976 funding constraints, the flight tests were not conducted. The contractors performed hardware-in-loop simulation and alternate missile design concept effort in FY 1976. In-house effort in FY 1976 and FY 197T supported the Cost and Operational Effectiveness Analysis (COEA), Army Systems Acquisition Review Council/Defense System Acquisition Review Council (ASARC/DSARC), and preparation for award of the ED contract. In FY 1977 the ED contract was awarded, the contract performance baseline established, the design effort initiated, major subcontracts awarded, and test plans developed. In FY 1978 the first ballistic and programed rounds were fired. Component and subsystem performance tests were completed and the new equipment training was initiated. The system was flight certified for the AH-1 test bed aircraft and fabrication and Producibility Engineering Planning was continued.

2. FY 1979 Program: The increase of 12.8 million over the FY 1978 program is required for the procurement and fabrication of hardware for testing. Missile flight test success criteria are being established, and development and tactical prototype firings are continuing. The tactical prototype is being designed and long lead items identified. Tests to be completed in FY 1979 are development prototype component qualification, and Advanced Attack Helicopter (YAH-64)/HELLFIRE integration and developmental tests. Physical teardown evaluation will also be completed. The first development and tactical prototype HELLFIRE missiles will be fired. The Production Engineering Planning (PEP) effort will continue and New Equipment Training (NET) courses are being conducted. Environmental storage tests conducted by the government will start in FY 1979.

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Engineering Development and Testing will continue at a high level during FY 1980. Operational Test (OT) II using the AH-1 (COBRA) helicopter will be conducted by the government and supported by the system prime contractor. System qualification tests will also be completed. Functional and physical configuration audits will be conducted and the Technical Data Package (TDP) will be approved. The Producibility Engineering and Planning (PEP) effort will continue. The Army Systems Acquisition Review Council/Defense System Acquisition Review Council (ASARC/DSARC) III reviews will be held and, given a favorable decision, preparation will begin for award of the Low Rate Initial Production (LRIP) contract.

4. FY 1981 Planned Program: Environmental Storage Tests will be completed by the government and the PEP effort will be completed by the contractor. The contractor will also support Operational Testing of the Advanced Attack Helicopter (YAH-64). Low Rate Initial Production will begin early in FY 1981.

5. Program to Completion: Production deliveries will start in FY 1982 and Production Validation Tests (PVT) will be conducted. HELLFIRE is scheduled to be operational on the YAH-64 in

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Helibome Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

I. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Competitive advanced development (AD) contracts were awarded to Rockwell International Corporation and Hughes Aircraft Company in June 1974. Rockwell International was selected as the engineering development (ED) contractor in October 1976 after an evaluation of proposals submitted by two competing contractors and an evaluation of each contractor's performance during the AD phase.

b. The Development Test and Evaluation of HELLFIRE consists of completed exploratory flight testing, which demonstrated conceptual feasibility, and planned engineering development tests to demonstrate design performance and operational suitability of tactically configured hardware. All exploratory testing was conducted with modified Air Force HORNET missiles equipped with modified FALCON motors, which were used as test bed missiles to flight test laser seekers. This exploratory flight testing began in 1970 and extended into 1974. No HELLFIRE missiles were flight tested during the AD contractual effort due to reduction in funds. The first flight test of a HELLFIRE missile was successfully conducted under the ED contract on 21 October 1978. The exploratory flight test program, the advanced development test, and the planned engineering development tests are described as follows:

(1) The exploratory flight test program consisted of fifty-six missiles; were successful. Twenty-nine of the fifty-six missiles tested were equipped with the Army Laser Seeker; were successful. of the failures were not related to HELLFIRE or the Laser Seeker. The unsuccessful tests based on seeker difficulties resulted from 6 unrelated problems with target acquisition and signal processing and 2 mechanical problems. There were no major problems, and these difficulties have not been repeated in the current flight test program. Forty-three of the missiles were launched from helicopters at ranges of and 13 were ground launched. Targets were illuminated by a laser designator at various ranges extending to This exploratory test program was conducted by the US Army Missile Research and Development Command and consisted of two separate programs: (1) Terminal Homing Accuracy Demonstration (THAD) Program; and (2) Technical Tests.

(a) The THAD Program began in 1970 to demonstrate that semi-active terminal homing would provide a viable kill technique against tanks. In 1971 and 1972 a series of 15 guided rounds were fired demonstrating a one foot overall system Circular Error Probable (CEP).

(b) The Technical Test Program objective was to demonstrate the technical feasibility of various operational firing modes. These firing modes were successfully demonstrated:

1. Ripple Fire - Two or more missiles are fired from the same launch platform at different targets using two or more separate laser target designators, each operating on different codes. Missiles can be successively launched at time intervals of approximately

2. Rapid Fire - Two or more missiles are fired from the same launch platform at multiple targets and designated successively by one laser target designator on a single code. Missiles can be launched at time intervals of approximately 8 seconds.

3. And night firing, indirect launches, autonomous and remote designation.

(2) The Advanced Development Program was for the purpose of developing competitive system designs and did not include any missile flight testing due to funding constraints. Environmental testing was accomplished on the launcher and missile container.

(3) Major elements of the HELLFIRE Engineering Development (ED) test program will be conducted in FY 79 and were initiated by the first guided flight test on 21 October 1978. The missile made a direct hit on a target which was designated from the ground and kilometers down range. On 17 December 1978, a second guided launch was made at a target at kilometers down range and designated from the ground. However, the helicopter in this test was at 60 knots forward speed and 125 feet altitude, and a direct hit was also scored. These tests will be completed in the 2nd quarter, FY 1980. Advanced Attack Helicopter (YAH-64)/HELLFIRE Modular Missile System integration and developmental tests will be conducted by the YAH-64 prime contractor and supported by the HELLFIRE prime contractor during CY 1979-1980. HELLFIRE system qualification tests will be conducted by the prime contractor and the US Army Missile Research and Development Command in the 4th quarter, FY 1979 through 4th quarter, FY 1980. During the Engineering Development program, 169 missiles will be flight tested to support both the Advanced Attack Helicopter and HELLFIRE developmental programs, system qualification, and operational tests. After the first 14 flights, the missile system will be essentially the version planned for production. Designation of the target will be varied throughout the tests. Remote designation will be provided by the Ground Laser Location Designator and the Lightweight Target Designator while both remote and autonomous will be from the Airborne Target Acquisition and Fire Control System and the Target Acquisition and Designation System. Missiles, launchers, and ground support equipment will be tested in actual and simulated operational environments to demonstrate performance and reliability of the design. Test conditions will include temperature, vibration, shock, acceleration, and storage. Environmental/Storage Tests will be conducted by the US Army Test and Evaluation Command and supported by the contractor during 1st Qtr FY 1980 - 1st Qtr FY 1982. After storage in adverse operational environments, some missiles will be flight tested and others will undergo physical teardown to assess degradation. Production

Validation Tests will be conducted by the contractor on the first production hardware to demonstrate that performance characteristics of production hardware are the same as demonstrated by prototypes. These tests will be conducted during 3rd and 4th Qtrs FY 1981.

2. Operational Test and Evaluation:

a. Laser Guided Missile System (LAGUMS) Military Potential Tests were conducted in 1972 and 1973. These tests evaluated the ability of the helicopter gunner during target engagement and examined the tactical employment of LAGUMS-equipped helicopters. The tests also provided information on exposure and detectability of the launch aircraft and target designators. The results of these tests were used in lieu of Operational Test (OT) I.

b. Additional operational tests were conducted by the US Army Combat Developments Experimentation Command (CDEC) during August-December 1974. These tests measured the vulnerability of the ground target designator. They also compared the mission effectiveness and operational performance of HELLFIRE versus extended range TOW.

c. Operational Test (OT) II will be conducted in the first quarter, FY 1980, with engineering development (ED) hardware to validate the operational capability of HELLFIRE using the COBRA helicopter as the test bed vehicle. Data will be obtained in an operational environment to assess the operational effectiveness to include command and control, hit performance, human factors, and safety. Information will be obtained on the reliability, availability, and maintainability (RAM) of the system during this test. This test will be conducted by the US Army Operational Test and Evaluation Agency (OTEA) in FY 1980 at Yuma Proving Grounds, AZ.

Program Element: #6.43.10.A
DoD Mission Area: #413 - Fire Support

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

3. System Characteristics:

Operational/Technical Characteristics	Objective*	Demonstrated Performance***
Weight (total)	75-95 pounds**	
Warhead Weight		
Range		
Diameter	7 inches**	
Length	65 inches**	
Time of Flight		
Time of Flight		

* As specified in 30 September 1977 System Acquisition Report.
** As specified in the Development Concept Paper.
*** Data will be reflected when available from development and operational testing.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT						
	QUANTITIES						
D599	PERSHING II						

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: PERSHING II is an evolutionary improvement to PERSHING Ia, which includes development of an improved reentry vehicle, propulsion section and ground support equipment changes that provide enhanced system reliability, accuracy and targeting flexibility plus reduced operating and support costs. PERSHING II is designed to meet the Supreme Allied Commander, Europe's (SACEUR's) stated need for a land mobile, surface-to-surface missile system that has long range, high accuracy and lower yield warheads for reduced collateral damage and better targeting flexibility; immediate responsiveness for time sensitive targets; battlefield survivability; target area penetrability; and, all-weather strike capability for the Joint Chiefs of Staff (JCS)/North Atlantic Treaty Organization (NATO) Quick Reaction Alert (QRA) role. Five missile test flights were conducted during the Advanced Development (AD) phase in FY 1978. These flights demonstrated the capability of the new terminal guidance technique to achieve the required system accuracy. In FY 1979, the system will enter Engineering Development (ED). During this phase the tactical configuration of the reentry vehicle, propulsion section and ground support equipment will be developed and tested. This phase will culminate with the firing of 28 missiles.

C. BASIS FOR FY 1980 RDTE REQUEST: Full-scale Engineering Development started in FY 1979. In FY 1980, fabrication of working models of the reentry vehicle components will be completed. Procurement of prototype material will be initiated for both the missile and ground support equipment modifications. Prototype fabrication will start on the airburst/surface burst warhead adaption kit, earth penetrator, and the reference scene generation shelter. Tooling design will be completed and fabrication of tooling initiated. Both fixed wing captive flight tests and wind tunnel tests will be conducted during this period.

* Additional funds included in Program Element 6.33.17.F, Theater Ballistic Missile Program, $18000.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Optional Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Start Development Test I	Nov 77	Nov 77	Nov 77
Complete Development Test I	May 78	May 78	Mar 78
Defense Systems Acquisition Review Council II	Dec 78	Dec 78	Jun 78
Award Engineering Development Contracts	Jan 79	Jan 79	Oct 78
Start Development/Operational Test II			
Long Lead Procurement			
Complete Development/Operational Test II			
Defense Systems Acquisition Review Council (DSARC) III			
Start Full Scale Production			
Production (Buy 2)			
Production (Buy 3)			
Production Deliveries Complete			

* Funding profile does not currently support Long Lead Procurement; to be corrected in FY 1981 Budget Request.

The delay in Development Test I was to correct quality problems which permitted successful test completion. The DSARC II delay resulted from the need to do additional analysis of the extended range variant of PERSHING II as directed by the Secretary of Defense. DSARC II was conducted 21 December 1978 and approval was given to initiate Full Scale Engineering Development. The Engineering Development milestones shown in this year's summary differ from last year's because the program has been revised to the extended range variant which has a longer development cycle. An option is available in the structured full scale development program to accelerate the Initial Operating Capability by as much as 16 months with concurrent production. The decision to select this option is open until the 1982 budget is formulated at which time procurement funding will be required in order to adopt the accelerated program.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	FY 1981	Additional to Completion	Total Estimated Cost
RDTE						
Funds (as shown in FY 1979 submission)	29645	10111	115984	-	202940	421964

The change from FY 1979 submission reflects increased research, development, test and evaluation (RDTE) cost of the extended range PERSHING II system which requires development of new missile stages to achieve increased range.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	0	0	0		
Funds (as shown in FY 1979 submission)						
Quantities (current requirements)						
Quantities (as shown in FY 1979 submission)						

Change from FY 1979 submission reflects increased MIPA cost of extended range PERSHING II system which requires procurement of new missile stages to achieve increased range. The quantity increase results from extending the life of the PERSHING II system because of longer development cycle for the extended range variant.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In order to meet the Supreme Allied Commander, Europe's (SACEUR's) expressed need for an improved, mobile, surface-to-surface missile system, a Special Task Force was formed in January 1973 to validate the need for an Improved PERSHING system and to develop a Concept Formulation Package for the system. In October 1973 the Decision Coordination Paper (DCP) for PERSHING II was presented to and approved by the Army Systems Acquisition Review Council (ASARC) and forwarded to the Defense Systems Acquisition Review Council (DSARC) on 22 January 1974. As a result of a favorable DSARC recommendation, the Deputy Secretary of Defense (DEPSECDEF) directed the Army to proceed with the Advanced Development (AD) of PERSHING II. Five missile flight tests were conducted during the AD phase in FY 1978. These flights demonstrated the capability of the new terminal guidance technique to achieve the required system accuracy. All objectives of the AD program were met. The Army on 18 July 1978 conducted an ASARC II and concluded that PERSHING II is ready for Engineering Development (ED). In an FY 1980 Ammended Program Decision Memorandum (PDM), the Secretary of Defense directed the Army to proceed to DSARC II as soon as possible with the extended range option of PERSHING II. A DSARC II was conducted 21 December 1978. As a result, the program was authorized to proceed into Engineering Development with extended range PERSHING II. Entry into ED is planned for January 1979. PERSHING II is a product improvement of the currently fielded PERSHING system using a new propulsion system to accommodate the greater range, modified ground support equipment that eliminates and/or consolidates hardware to reduce firing platoon response times by a factor of more than 50%, achieve greater flexibility, and reduce operating personnel. PERSHING II incorporates a new reentry vehicle that uses Radar Area Correlation Terminal Guidance to provide accuracy in the range of 20-40 meters Circular Error Probable (CEP). This high accuracy provides the capability to effectively use low yield or specialized warheads. During the ED phase, the tactical configuration of the reentry vehicle, propulsion stages, and ground support equipment will be developed and tested. This phase will culminate with the firing of 28 missiles during Development/Operational Test II. During FY 1978, significant factors were illuminated by the North Atlantic Treaty Organization (NATO) High Level Group discussions on Theater Nuclear Forces Modernization.

PERSHING II will have a range capability from KM thus providing an immediately responsive firing capability covering the region from the forward edge of the battle area into the Western Military Districts of the Soviet Union. PERSHING II is a mobile, survivable ballistic missile with terminal guidance that provides rapid response, assured penetration to the target area, high surgical accuracy, minimum collateral damage, and thus the ability to attack mobile and fixed time sensitive targets. PERSHING II offers a unique capability to attack hardpoint targets with an earth penetrator warhead. The system has a rapid retargeting capability that makes it responsive to both the SACEUR and the Theater Army Commander. Initial Operational Capability (IOC) is planned for , but an option to improve the IOC by up to 16 months will be retained for approximately two more years if required to implement evolving US policy for modernization of our Theater Nuclear Forces on an accelerated basis. Mobility and survivability are improved because of decreased ground support equipment which improves employment flexibility.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

G. RELATED ACTIVITIES: Close coordination is maintained with the Air Force on advanced ballistic reentry developments. Prior year efforts in surface-to-surface missile PERSHING (Program Elements (PE) 2.21.62.A and 2.22.54.A) and Radar Area Correlation (PE 6.33.06.A) under the US Army Materiel Development and Readiness Command have been conducted by the same Project Manager (PM) selected to develop this project. These efforts have been closely coordinated with the US Army Missile Research and Development Command funded under PE 6.23.03.A, Missile Technology. This program is coordinated with all Services by the Office of the Secretary of Defense (OSD). The technology employed in PERSHING II terminal guidance is unique to PERSHING. Additionally, the requirement for PERSHING II to be responsive to targeting requirements from the forward edge of the battle area to its maximum range makes the system capabilities distinct from those of other Services. The tactical mobility of the system, which provides sustained operations without constraining dependence on a main operating base, makes the system uniquely Army.

H. WORK PERFORMED BY: US Army Missile Research and Development Command, Redstone Arsenal, AL; White Sands Missile Range, NM; Martin-Marietta, Orlando, FL; Goodyear Aerospace Corporation, Akron, OH; Singer Company (Kearfott Division), Little Falls, NJ; Bendix Corporation (Navigation and Control Division), Teterboro, NJ; and Hercules Aerospace, Salt Lake City, UT.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The PERSHING II program started in FY 1975. The primary effort during that year was directed toward design of the reentry vehicle (RV) for the missile flight program in FY 1978. The RV underwent design changes during FY 1975 as a result of the Radar Area Correlation fixed wing flight demonstration program. The US Army Armament Research and Development Command, Dover, NJ, was tasked with the responsibility for developing the adaption kit for the airburst/surface burst warhead section. The Department of Energy (DOE) was tasked with developing the earth penetrator warhead. The earth penetrator integrated design was completed and successfully tested at high velocities into The major prototype missile components were delivered, RV fabrication and ground/captive testing was completed for the Advanced Development (AD) missile flight hardware. The five-missile flight demonstration program was conducted in FY 1978. The capability of the Radar Area Correlation Guidance Systems to attain the desired accuracy in a missile flight environment was proven during AD culminating with flight five which recorded a meter miss distance. The payload was an earth penetrator (EP) vehicle and the capability of the EP to withstand missile flight environments, impact, and penetration was also demonstrated. Preparations were initiated in FY 1978 for the Defense Systems Acquisition Review Council (DSARC) II. All Advanced Development objectives have been accomplished and PERSHING II is ready for entry into Engineering Development (ED).

2. FY 1979 Program: DSARC II was conducted in December 1978 and the ED phase planned for initiation in January 1979 preparing for Development Test/Operational Test (DT/OT) II and subsequent production go-ahead. Conducted during this period will be initial reentry vehicle structure, propulsion section, and ground support equipment design; integrated electronics unit prototype design; warhead adaption kit design; and, guidance reference scene equipment prototype design. FY 1979 is the first year of a projected 57-month ED phase.

3. FY 1980 Planned Program: In FY 1980, fabrication of working models of the reentry vehicle components will be completed and procurement of Development Test/Operational Test (DT/OT) II ground support equipment modifications and flight hardware will be initiated. Testing of the prototype integrated electronics unit and propulsion section components will be conducted. Producibility Engineering and Planning and initial production tooling design/procurement and drawing release will occur. Initial software development will be completed. Both fixed wing captive flight tests and wind tunnel tests will be conducted during this period.

4. FY 1981 Planned Program: In FY 1981, procurement of prototype material will be completed and fabrication of the prototype hardware for the DT/OT II missile flight tests will be initiated. Fabrication of prototype tooling will be completed and component subsystem tests will be initiated.

5. Program to Completion: This is a continuing program. Prototype hardware build will be completed and intensive system tests conducted. DT/OT II will be conducted on production hard-tooled hardware in preparation for a production decision during FY 1984. The Initial Operational Capability should occur in providing troop units in Europe and the Continental United States with a modernized system designed to meet the threat of the 1990's.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: During FY 1978, system test and fixed wing captive test were conducted in preparation for five Advanced Development (AD) missile flights. THe planned sixth flight was cancelled because of the success demonstrated through flight five. The missile flights were conducted at White Sands Missile Range, NM, using an earth penetrator warhead as the payload. All flights were tested at a range of since the inertial and radar correlation guidance techniques are independent of range. While quality problems were experienced, the overall flight test program at White Sands Missile Range was successful and all objectives were demonstrated. The prime contractor is Martin-Marietta of Orlando, FL.

Specific Goals in Advance Development:

	Objectives	Status
Inertial Measuring Unit (IMU)	CEP without terminal guidance	Analytically Demonstrated
Sensor Correlator Subsystem (SCS)	CEP	Demonstrated in Captive & Missile Flights
Reentry Vehicle (RV)	RV will withstand the flight environment	Demonstrated in Missile Flight Tests

Full-scale Engineering Development (ED) is planned to begin in January 1979. During the first year of ED limited component and subsystem tests will be conducted. System, wind tunnel, captive flight tests starting in the objective of these tests will be to demonstrate the accuracy and range of the system using the tactical configuration.

Warhead Tests: Warhead testing, to include the adaption kit, will involve component qualification, laboratory preflight, environmental, electromagnetic radiation and fire vulnerability, and explosive ordnance render safe procedures. Systems compatibility will be verified during flight tests. In addition, the earth penetrator (EP) warhead will be further subjected to Davis gun and reverse ballistics tests to demonstrate the ability of the EP to survive under varying missile impact velocities.

Program Element: #6.43.11.A
DoD Mission Area: #422 - Interdiction

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

2. Operational Test and Evaluation:

a. During Advanced Development, the US Army Operational Test and Evaluation Agency (OTEA) concluded that Operational Test (OT) I was not necessary. However, OTEA did participate in the Development Test (DT) I tests by observing with a broad view toward refining operational issues. OTEA has reviewed DT I test data and concurs that the system is ready to enter Engineering Development.

b. The 56th Brigade in Europe conducted a successful large scale field test of PERSHING Ia during early FY 1978 that provided input data for Army PERSHING II survivability studies. However, no operational experience has been gained from PERSHING II.

c. During Engineering Development, OTEA will conduct operational testing to include both nonflight ground test (early-FY 1983) and 14 missile flights tests (mid-FY In addition to actually conducted the above tests, OTEA will observe the development test phase of the Engineering Development program.

3. System Characteristics: Selected operational and technical characteristics are as follows:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Maintainability (mean time to repair)		To be determined
Range Requirements		To be determined
Accuracy		1/

1/ Capability demonstrated in captive and missile flight tests during Advanced Development.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.13.A Title: GRASS BLADE
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	14209	27200	30215	9700	0	96337
D112	GRASS BLADE	14209	27200	30215	9700	0	96337

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Program content is SECRET "Limited Distribution - Special Access Required," precluding further description in this summary. Access to GRASS BLADE information is controlled by the Deputy Chief of Staff for Research, Development, and Acquisition.

C. BASIS FOR FY 1980 RDTE REQUEST: Continue RDTE effort.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE Funds (as shown in FY 1979 submission)	13459	27200	18279	7000	80953

Details on funding increases in FY 1980 and 1981 are available upon request in accordance with paragraph B above. Project was formerly carried under Program Element 6.33.17.A, GRASS BLADE.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	0	0	69800	176400	246200
Funds (as shown in FY 1979 submission)			Not Shown			

Missile Procurement, Army, program was formulated in FY78 with funding starting in FY81.

Program Element: #6.43.13.A
DoD Mission Area: #414 - Field Army Air Defense

Title: GRASS BLADE
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Program content is SECRET "Limited Distribution - Special Access Required," precluding further description in this summary. Access to GRASS BLADE information is controlled by the Deputy Chief of Staff for Research, Development, and Acquisition.

G. RELATED ACTIVITIES: This project is related to work in other Army technology programs.

H. WORK PERFORMED BY: Both in-house and under contracts.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: Details may be provided upon request in accordance with paragraph B above.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire and Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	15000	35100	89300	139400
	QUANTITIES						62
D078	Fire & Forget Seeker, HELLFIRE	0	0	13500	33100	89300	135900
D076	Focal Plane Array Detectors	0	0	1500	2000	-	3500

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Fire and Forget Seeker for HELLFIRE provides for the development of an antitank capability which can be fired from the Advanced Attack Helicopter (AAH) and allow the AAH to remask after firing. The exposure time of the AAH to enemy attack is significantly reduced and thus the survivability is enhanced. The Fire and Forget Seeker also adds an improved capability for operation in battlefield obscuration and weather. This seeker will be used on the HELLFIRE Modular Missile System to complement the laser seeker and meet the armored threat of the 1980-1990 timeframe.

C. BASIS FOR FY 1980 RDTE REQUEST: In the 2d Quarter FY80, after competitive procurement and proposal evaluation, a single contract will be awarded to enter Engineering Development of the seeker. The existing contract with the HELLFIRE Modular Missile System prime contractor will be modified to include system integration activities.

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire and Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) II	Oct 79	Program Element not included in 1979 Submission
Engineering Development Contract Award	Mar 80	
Operational Test II Complete	Nov 82	
ASARC/DSARC III	Feb 83	
Initial Operational Capability (Current Generation Detection)	— — —	
Initial Operational Capability (Focal Plane Array Detection)	— — —	

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands): This program element was not included in FY 1979 submission.

E. OTHER APPROPRIATION FUNDS: ($ in thousands): Not applicable.

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire and Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Exploratory Development of imaging infrared seekers began in 1972 with competitive contracts awarded to Texas Instruments (TI) and Hughes Aircraft Company (HAC). In 1975, modified contracts required TI to develop a seeker using the TOW night sight technology and components and the HAC version to be a small scale derivative of the MAVERICK 12-inch seeker. A two-year contract was awarded to TI in June 1977 to demonstrate manufacturing methods and technology. The shared technology with the Common Module Night Sight program and the Air Force imaging infrared MAVERICK program support the maturity of this generation of imaging infrared technology to enter Engineering Development. The design of this seeker will be such that it can accomodate either the current generation or the focal plane array detectors. With a focal plane array detector, the improvement in sensitivity will provide greater seeker lock-on ranges and better performance in reduced visibility environments. The focal plane array technology development will be intensified (and monitored) for application in the HELLFIRE Fire and Forget seeker. A decision will be made in FY81 on which detector to use in the seeker. The objective of this program is to produce an imaging infrared seeker using thermal contrasting between target and background. Once this seeker is fired, the Advanced Attack Helicopter (AAH) may remask or engage another target. The survivability of the AAH will be significantly enhanced due to less exposure time to enemy attack. This seeker will also provide an improved capability for use in adverse weather or battlefield obscuration. Generally the same countermeasures cannot be used against both laser and imaging infrared seekers and a much enhanced antitank capability is available to the AAH. HELLFIRE will be effective against targets out to [1] and penetrate a minimum of , with the capability to defeat potential enemy tanks of the 1980 - 1990 timeframe.

G. RELATED ACTIVITIES: The HELLFIRE Modular Missile System is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination is effected through technology coordination groups, frequent liaison visits, exchange of components and subsystems, and exchange of analyses, simulation, and hardware test results. The exploratory prototype program for the imaging infrared seeker using current technology has been conducted under Program Element (PE) 6.23.03.A, Missile Technology. The basic research and exploratory development programs for focal plane array detectors are being supported by the Army Night Vision Laboratories in PE 6.27.09, Night Vision Investigations/Far Infrared, and by the Defense Advanced Research Projects Agency with a variety of individual contracts. Work on the HELLFIRE Modular Missile System with the laser seeker has progressed from 6.23.03.A, Missile Technology; 6.33.10.A, Heliborne Missile - HELLFIRE; to 6.43.10.A, Heliborne Missile - HELLFIRE. The US Air Force portion of the Tri-Service Laser Seeker development is funded under PE 6.46.08.F, Close Air Support Weapon System. The Air Force has elected not to employ the Tri-Service Laser Seeker on the MAVERICK Missile. The Air Force imaging infrared seeker for MAVERICK is funded under PE 6.46.08.F. The Advance Attack Helicopter is funded under PE 6.42.07.A.

H. WORK PERFORMED BY: Contractors for the development of the imaging infrared seeker will be selected by competitive proposal in FY 1980. Rockwell International Corporation of Columbus, OH and Anaheim, CA., is the prime contractor for the HELLFIRE Modular Missile System.

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire and Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENT AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Exploratory development in current generation technology continued from 1972 to 1977 with Texas Instrument (TI) and Hughes Aircraft Company participating. Phase I of a manufacturing methods and technology (MM&T) contract to TI began in 1977 to establish production techniques for imaging infrared seekers. Numerous contracts in exploratory development for focal plane array have been started. These efforts are exploring material development, signal processing, and operational aspects of different frequency ranges.

2. FY 1979 Program: Phase II of the MM&T contract will culminate this year with the delivery of ten seekers to validate efficient production techniques. Brassboard hardware of focal plane array detectors will be tested, and efforts will be expanded in material development and investigation of different frequency spectrums.

3. FY 1980 Planned Program: Engineering Development (ED) will be initiated in FY 1980 to design and fabricate prototype imaging infrared seekers, define a concept and necessary hardware required to handoff information from the AAH target acquisition device to the missile and to perform supporting analyses, simulations and tests. Procurement of HELLFIRE airframes, launchers, and other hardware required for system integration will begin. Parallel development of an IIR detector using focal plane array technology and present generation technology will begin. The fire and forget seeker design will be capable of accepting either detector. A detector selection will be made in FY 1981 for continuation of engineering development. Authorization of full scale development is essential even though all prescribed conditions have not been met. The imaging infrared seeker has not been in the Advanced Development phases but the technology is sufficiently mature to progress into Engineering Development with little risk. Programs with similar technology are the Common Module Night Sight and the MAVERICK imaging infrared programs in ED. The fielding of this "fire and forget" capability is a high priority program for the Army, and, along with the small risk and earlier availability with commensurate research and development dollar savings, urges entry into Engineering Development in FY 1980. Focal plane array technology development will continue, and additional contracts (DO76) will be used to insure a sufficient amount of effort by different contractors to provide a viable competitive situation.

4. FY 1981 Planned Program: Engineering Development of the seeker will continue with integration with the HELLFIRE missile. Hardware deliveries of seekers, missiles, launchers and other hardware will begin during the 4th quarter. A decision will be made to complete the development program using either a current technology or a focal plane array detector.

5. Program to Completion: Seeker qualification test and hardware in the loop simulations will evolve into system qualification tests. Guided flight tests will begin during 2nd quarter, FY82 and continue for 12 months. Operational tests will start 4th quarter, FY82 with a production decision in the 2nd quarter, FY83. Production deliveries will then begin during 2nd quarter, FY84.

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire & Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Exploratory development of imaging infrared seekers began in 1972 with competitive contracts awarded to Texas Instruments (TI) and Hughes Aircraft Company (HAC). In 1975, modified contracts required TI to develop a seeker using the TOW night sight technology and components and the HAC version to be a small scale derivative of the MAVERICK 12-inch seeker. Both seekers have demonstrated essentially the same performance in captive flight tests conducted by US Army Missile Research and Development Command in 1976. The scope of the tests was to demonstrate seeker lock-on ranges, aim-point distribution, and tracking against tanks. The results of 159 runs indicate that the technology will meet the Army requirements. Tests of the focal plane array detectors will be conducted to determine which detector is the best for HELLFIRE application.

b. A two-year contract to demonstrate manufacturing methods and technology was awarded to TI in June 1977 with ten seeker heads to be delivered. The first phase of this contract established production techniques with the second stage demonstrating the validity of these concepts by fabricating ten seekers. This hardware also uses the infrared common module detectors employed in the previous development contract and the TOW, DRAGON, and FLIR night vision sights. The seeker will be used on the HELLFIRE Modular Missile body which is being developed under another program.

2. Operational Test and Evaluation:

a. The captive flight tests performed by US Army Missile Research and Development Command in 1976 were conducted from a helicopter against tanks which in 36 runs were using methods to suppress the infrared signature. Moving targets of various kinds were deployed in a large number of the 159 runs for the purpose of attempting to simulate tactical targets and to vary the target and background conditions. Lock-on ranges during these tests averaged during both day and night conditions, which meets Army requirements.

b. Operational Test II is presently projected for the July through December 1982 timeframe. The agency to perform the test will be determined at a later date. The Advanced Attack Helicopter (YAH-64) will be the weapons platform to validate the operational capability of the HELLFIRE Modular Missile System with the imaging infrared seeker. Operational performance, safety characteristics, reliability, availability, and maintainability will be assessed during these tests.

Program Element: #6.43.16.A
DoD Mission Area: #413 - Fire Support

Title: Fire & Forget HELLFIRE
Budget Activity: #4 - Tactical Programs

3. Systems Characteristics

Operational/Technical Characteristics	Objective*	Demonstrated Performance
Weight (total)	75-95 pounds**	
Warhead Weight		
Range		
Diameter	7 inches**	
Length	65 inches**	
Time of Flight		
Time of Flight		

* As specified in 30 September 1977 System Acquisition Report, HELLFIRE Modular Missile System.
** As specified in Development Concept Paper, HELLFIRE Modular Missile System.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.18.A
Title: Division Air Defense (DIVAD) Gun
DoD Mission Area: #414 - Field Army Air Defense
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	16972	75717	25719	40325	18737	179714
	QUANTITIES						4
D648	Division Air Defense (DIVAD) Gun	16972	75717	25719	40325	18737	179714

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides necessary development prototyping, and evaluation *effort to define and develop a new weapon* to meet Army requirements for low altitude air defense in the forward maneuver area during the mid-1980 time period. Current air defense systems in the field and under development cannot provide the forward maneuver units of Army divisions the necessary protection.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds will permit continuation of the accelerated competitive development program to provide a radar directed, medium caliber (35 or 40mm) self-propelled gun that will significantly improve the divisional short range, low altitude air defense capability in the 1980's. Two contractors will continue preproduction prototype development in preparation for delivery to the Army, two systems each for competitive testing, and selection of one contractor for initial production. The requested level of funding is required to enable contractors to complete the accelerated competitive development effort in 29 months. Major milestones are:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiate Development	Jan 1978	Jan 1978
Complete Prototype Evaluation	Sep 1980	Jul 1980
Initial Production Contract Award	Oct 1980	
Complete Engineering Development	Sep 1982	Apr 1981
Activate First Gun Battalion		

Program Element: #6.43.18.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Division Air Defense Gun
Budget Activity: #4 - Tactical Programs

The change in milestone dates shown for completion of prototype evaluation is a correction. The correct date which should have been shown last year is September 1980. The Initial Production Contract is still scheduled for award in October 1980. The complete Engineering Development milestone is changed to reflect the completion of fire unit prototype development in June 1980 and completion of the development of training and logistics equipment in September 1982.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	16973	75717	23119	66632	182441

The change in funding reflected for FY 1980 is the result of moving forward $2.6M from the FY 1981 and 1982 estimates. These funds are necessary to initiate selected Technology Transfer, Fabrication and Test (TTF&T) activities which must be completed prior to US production of the gun and ammunition. The original concept shown in the FY 1979 submission was to conduct all TTF&T after selection of a single contractor for initial production. A program to accomplish selected TTF&T earlier in the development cycle will reduce schedule risk and procurement costs. An additional $5M will be necessary in FY 1981 to complete this effort.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles Procurement, Army:						
Funds (current requirements)	0	0	0	274800	2211100	2485900
Funds (as shown in FY 1979 submission)	0	0	0		2436000	2436000
Quantities (current requirements)	0	0	0	12	606	618
Quantities (as shown in FY 1979 submission)	0	0	0		618	618

Program Element: #6.43.18.A
Title: Division Air Defense Gun
DoD Mission Area: #414 - Field Army Air Defense
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	0	0	0	50300	613400	663700
Funds (as shown in FY 1979 submission)	Not shown in FY 1979 submission					
Quantities (current requirements)	0	0	0	319000	28281000	28600000
Quantities (as shown in FY 1979 submission)	Not shown in FY 1979 submission					

The change in WTCV Total Estimated Cost from $2436.0M in the FY 1979 submission to $2485.9M in the FY 1980 submission is due to the following: The use of more current inflation indices; a shift of $86.2M from FY 1982 to FY 1986 resulting in higher program year costs; an estimated increase in the cost for Field Maintenance Test Sets (FMTS) due to a change in deployment concepts which preclude DIVAD Gun and ROLAND from sharing FMTS; a decrease in repair parts procurement in the outyears.

Program Element: #6.43.18.A Title: Division Air Defense Gun
DoD Mission Area: #414 - Field Army Air Defense Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The new Division Air Defense Gun development program (Project #D648) is the culmination of several years of effort by the Army to define its short range air defense requirements which established the need for a new air defense gun. This requirement was established March 1977 with the approval of a Required Operational Capability (ROC) document for a new air defense gun in the medium caliber (30-40mm) range which could adequately meet the threat of the 1980's. This gun will give divisional maneuver forces a quick reacting weapon system that can effectively engage pop-up targets such as helicopters armed with antitank guided missiles and high speed, low flying aircraft at distances of up to The system will be mounted on a tank chassis to provide mobility compatible with maneuver forces and will have a full solution fire control system with an optical backup to provide an all environment (i.e., electronic countermeasures and adverse weather) capability. The system will have a rapid changeover capability to provide ground support fires if required and if the air situation permits.

G. RELATED ACTIVITIES: Prior to FY 1979 work was performed under Program Element (PE) 6.33.01.A. The two contractors developing prototypes are using mature components or modifications thereof developed by both foreign and domestic concerns. This will greatly enhance interoperability with both our NATO allies and other US military services. Foreign developed guns, ammunition, and modified feeder systems. Ford Aerospace and Communications Corporation (FACC) is using the Bofors L70 40mm gun from Sweden and General Dynamics (GD) is using the Oerlikon KDA 35mm gun from Switzerland. Both guns are widely deployed in NATO. US developed radars, computers, Identification Friend or Foe (IFF), and Field Maintenance Test Sets (FMTS). FACC is modifying the radar and computer developed for the F-16 fighter (Program Element 2.71.61.F) and GD is modifying the fire control system developed for the Navy's Phalanx Air Defense System (Program Element 6.43.58.N). Both contractors will adapt; the IFF developed for the STINGER air defense missile system (Program Element 6.43.06.A), the ROLAND FMTS (Program Element 6.43.09.A) and the M48A5 tank chassis. Close liaison is being maintained with each developing country and agency to prevent duplication of efforts. Where possible test data from previous foreign Air Force, Navy or other developer tests of these components will be used in lieu of separate tests.

H. WORK PERFORMED BY: The program is managed by the Project Manager for DIVAD Gun, US Army Armament Research and Development Command, Dover, NJ. Contracts have been awarded to Ford Aerospace and Communications Corporation (FACC), Aeronutronic Division, and General Dynamics (GD), Pomona Division, for the competitive development of a DIVAD Gun system.

Program Element: #6.43.18.A
DoD Mission Area: #414 - Field Army Air Defense

Title: Division Air Defense (DIVAD) Gun
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Gun Low Altitude Air Defense System (GLAADS) test bed was delivered to the Army in September 1975. The purpose of the test bed was to demonstrate through use of off-the-shelf hardware, the extent to which current technology could be used in the design of a modern gun air defense system. Testing was concluded in December 1975. The major conclusion of the test was that a second order digital fire control could be integrated with an air defense gun to provide a capability to effectively engage maneuvering targets. A Cost and Operational Effectiveness Analysis (COEA) was conducted to determine the most cost effective solution to our divisional air defense needs. In April 1977, the Secretary of Defense approved development of the DIVAD Gun subject to completion of a COEA and a Defense Systems Acquisition Review Council (DSARC) review of proposal costs prior to contract award. The Request for Proposal (RFP) was released in April 1977 and five contractors submitted proposals in July 1977. The COEA and evaluation of the proposals were completed in September 1977. Army Systems Acquisition Review Council (ASARC) II was held in October 1977 and DSARC II was held in November 1977. Announcement of the selected contractors, FACC and General Dynamics (GD), was made in November 1977. The Under Secretary of Defense approved the DSARC II recommendation on 6 January 1978. The Army signed the contracts with FACC and GD on 13 January 1978.

2. FY 1979 Program: Contractors will continue prototype fabrication under the accelerated 29 month development program. Design freeze is expected December 1978. Preparation for developmental and operational testing is being accomplished. The Request for Proposal (RFP) for initial production contract is being prepared.

3. FY 1980 Planned Program: Contractor testing of prototypes at government facilities will begin April 1980 with delivery of the prototypes to the Army scheduled for June 1980. Development Test/Operational Test (DT/OT) is scheduled from June through September 1980. The RFP will be released to Ford Aerospace and Communications Corporation (FACC) and General Dynamics (GD). Evaluation of proposals and test results will begin in June 1980 and will be completed in September 1980.

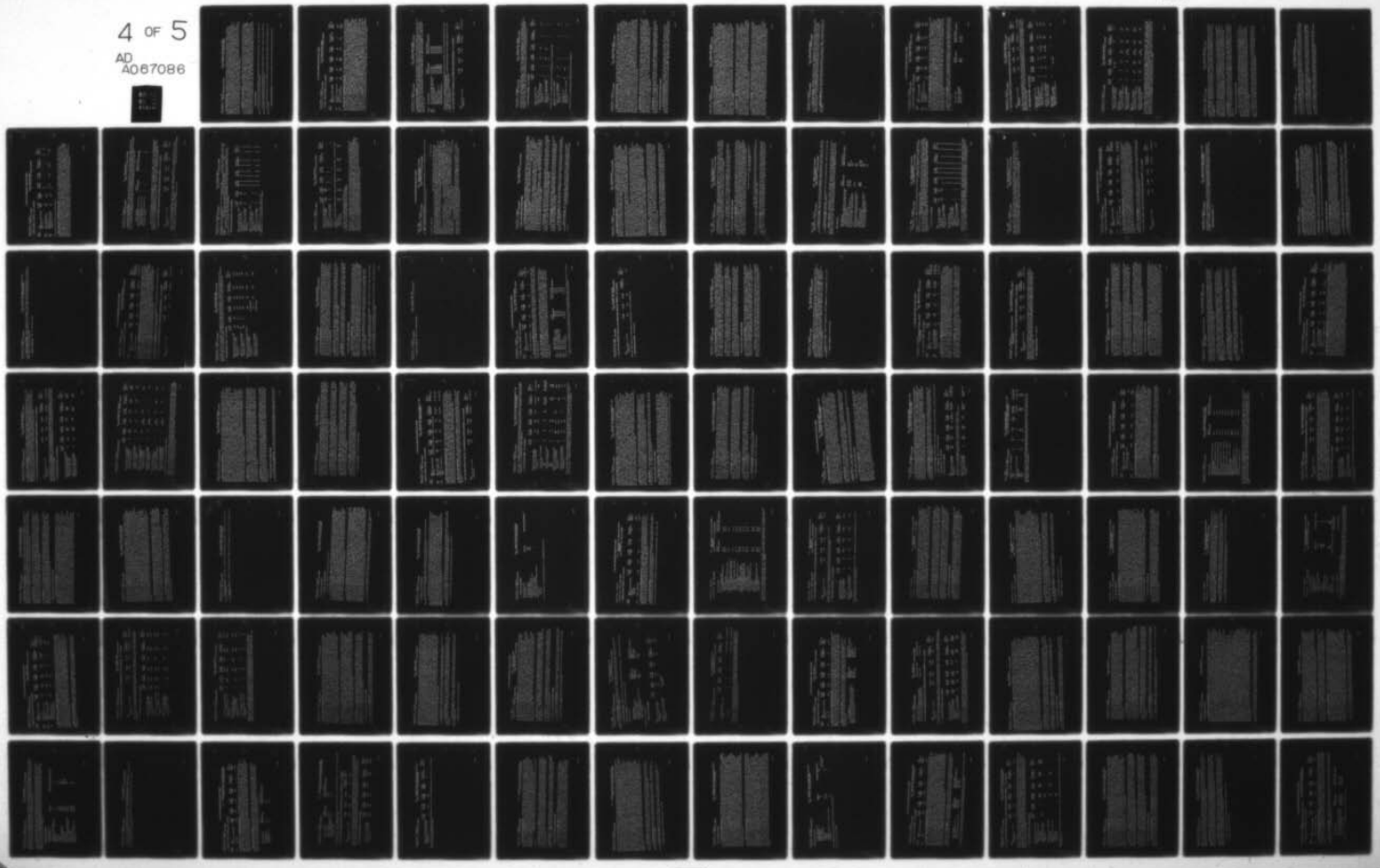
4. FY 1981 Planned Program: Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III will be held in October 1980 with contract to the winning contractor in October 1980. The final producibility, engineering and planning (PEP) effort will start in October 1980. Technology Transfer, Fabrication and Test (TTF&T) for foreign guns and ammunition and Integrated Logistics Support (ILS) phases will begin during first quarter FY 1981. A short maturity phase may be initiated to correct problems uncovered during DT/OT. The initial production contract for the first 200 systems will be awarded in the first quarter FY 1981 also.

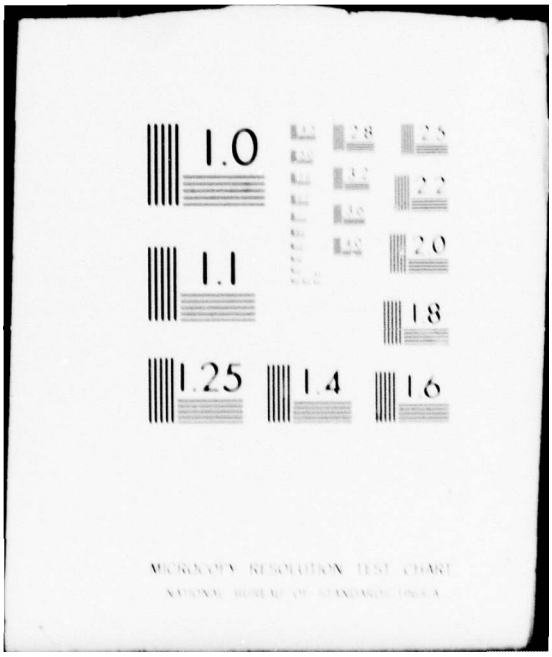
5. Program to Completion: This is a continuing program. Conversion of the two research and development (R&D) prototyypes to production configuration will be completed January 1982. The ILS and TTF&T phases will be completed by the fourth quarter FY 1982. Delivery of the first production systems will begin in June 1982. Follow-on production contracts for 418 systems will be awarded during the third quarter FY 1982. The first gun battalion will be fielded in Program completion is estimated for FY 1987.

AD-A067 086 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 5/1
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
JAN 79

UNCLASSIFIED NL

4 OF 5
AD A067086




1.0
1.1
1.25
1.4
1.6
2.8
2.5
3.2
2.2
3.6
2.0
4.0
1.8
MICROCOPY RESOLUTION TEST CHART

J. TEST AND EVALUATION DATA: The DIVAD Gun program features an accelerated "hands off" acquisition approach designed to achieve an Initial Operational Capability (IOC) in the minimum possible time at an affordable cost. In keeping with this approach, a combined development test/operational test (DT/OT II) of three months duration, starting in June 1980, will be conducted jointly by the US Army Operational Test and Evaluation Agency (OTEA), the US Army Material Systems Analysis Agency (AMSAA), and the US Army Test and Evaluation Command (TECOM), to provide the data necessary to assist decisions that lead to the selection of a winning DIVAD system and those in support of the production decision. Extensive use will be made of previous test data available from European sources, other service programs, and the prime contractors to supplement DT/OT II data. If necessary, a maturation phase will be conducted to incorporate changes into the system to correct shortcomings from DT/OT II. A check test will be conducted to verify corrective changes. Additionally, a supportability verification test will be performed later in the second phase after development of logistic and training equipment.

1. Development Test and Evaluation: Two development contractors were selected by the Source Selection Evaluation Board early in FY 1978. At the end of the 29-month development program, each contractor will deliver two "prototypes for production" for the combined DT/OT II. The combined DT/OT II will be conducted in three phases: Non-Fire tracking phase; live fire phase; and a non-fire maneuver phase. Testing will be conducted in various conditions of visibility, electronic countermeasures (ECM), target type (including ground targets), target maneuver, and range. Throughout the exercise, user personnel will operate the equipment under varied operational conditions. To the maximum extent possible, evaluation will be concurrent with the testing effort. Final evaluation will occur no earlier than 30 days following test completion. The prototypes tested will be as mature as possible. DT/OT II is scheduled to begin in June 1980. The critical issues to be addressed during the combined DT/OT II are:

a. Mission Performance:

(1) How effectively does the DIVAD Gun, when operated by typical user personnel, detect, track, identify, engage, and damage, or destroy hostile aircraft and ground targets?

(2) How is system operational effectiveness affected by varying conditions of weather, terrain, day/night visibility, degraded battlefield visibility, and electronic warfare?

(3) How well and how safely can the crew perform the operational functions necessary for effective employment of the DIVAD Gun system?

b. Vulnerability/Survivability: How well can the DIVAD Gun system survive the spectrum of battlefield threats?

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.01.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5628	6964	5849	2049	5260	52071
	QUANTITIES						
D029	Lightweight Company Mortar Systems	529	1220	1000	200	0	29270
D144	Smoke Mortar Rounds	0	2744	1849	1849	5260	11702
D227	Battalion Mortar System	5099	3000	3000	0	0	11099

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports development to improve the performance and effectiveness of Army mortar systems. Mortar systems provide the small unit ground commanders at the company and battalion levels with their own responsive, high-angle, indirect fire support capability. Hence, it is imperative that the mortar systems be capable of influencing the battle throughout the battalion area of operations. The 60mm Lightweight Company Mortar System (LWCMS) provides the company commander in nonmechanized infantry units with a lightweight, responsive, easily transportable indirect fire weapon capable of delivering both high explosive (HE) and illumination fires in offensive and defensive missions. The 81mm mortar system will provide the company commander in mechanized units and the battalion commander in nonmechanized units with a weapon capable of achieving greater range, greater lethality, a higher sustained rate of fire, and improved stability over the current 81mm mortar. The 4.2" battalion mortar currently provides adequate heavy mortar capability at the battalion level in an HE role, but lacks the capability to provide long-lasting screening smoke. Current smoke cartridges for the 81mm and 4.2" mortars, in use since the 1940's, are lacking in screening capability. The addition of a long-lasting screening smoke cartridge at the battalion level will provide the ground commander with a greatly improved battlefield obscuration capability. This program provides for: the development of training ammunition for the M224, 60mm Lightweight Company Mortar System (type classified in July 1977); the development of long-lasting screening smoke cartridges for the 81mm and 4.2" mortar systems; and the test, evaluation, and preparation for procurement of the United Kingdom (UK) L16A2 mortar barrel, L5A4 mount, and related UK ammunition in support of the Required Operational Capability (ROC) for an improved 81mm mortar system (Battalion Mortar System).

Program Element: #6.46.01.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: The request for $1.0 million for Project D029, Lightweight Company Mortar System, will permit engineering development (ED) and testing of the XM745 multioption training fuze. The request for $1.849 million for Project D144, Smoke Mortar Rounds, will initiate engineering development of an improved 81mm mortar smoke cartridge. The request for $3.0 million for Project D227, Battalion Mortar System, will permit completion of testing, the integration of logistics support, the preparation of the Technical Data Package for the improved 81mm mortar, and engineering development of an improved high explosive (HE) round.

Project	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
D029	Type Classification 60mm Training Round	4Q FY 1979	4Q FY 1979
D144	Type Classification 81mm Smoke Round	4Q FY 1984*	4Q FY 1981
D227	Acquire 18 Test Weapons	1Q FY 1979	1Q FY 1979
	Begin DT/OT Test	1Q FY 1979**	1Q FY 1979
	Complete DT/OT Test	2Q FY 1980***	3Q FY 1979
	Development Acceptance IPR	2Q FY 1980***	3Q FY 1979
	Type Classification	2Q FY 1980***	4Q FY 1979
	Initial Operation Capability	4Q FY 1981***	1Q FY 1981

* Difference due to postponement of ED until a decision is made as to whether or not to acquire the UK L16A2 mortar barrel and M5A2 mount to fulfill the improved 81mm ROC.
** DT began as scheduled. OT was delayed because of problems discovered during DT which prevented issuance of full safety release. OT is expected to start in August 1979.
*** Change caused by delay of OT.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	3629	7015	7085	Continuing	Not Applicable

Program Element: #6.46.01.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

Differences between FY 1979 and FY 1980 submit: FY 1978: $1.99 million was reprogramed into the Program Element (PE) to accelerate Project D227, Battalion Mortar System. FY 1979: $51 thousand was reprogramed from D144, Smoke Mortar Rounds into higher priority projects. FY 1980: $1.236 million reduction is due to the decision to delay advancing into engineering development of D144, Smoke Mortar Rounds, until a firm decision is made to procure the battalion mortar system.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles, Army						
Mortar, 81mm, XM252						
Funds (current requirements)	0	0	10.5	10.8	0	21.3
Funds (as shown in FY 1979 submission)	0	0	0	-	0	0
Quantities (current requirements)	0	0	780	768	0	0
Quantities (as shown in FY 1979 submission)	0	0	0	-	0	0

Differences due to the proposed procurement of the UK 81mm mortar in FY 1980 and FY 1981.

Lightweight Company Mortar (LWCMS), M224						
Funds (current requirements)	3.4	9.6	0	0	0	13.0
Funds (as shown in FY 1979 submission)	0	0	0	-	0	0
Quantities (current requirements)	190	1400	0	-	0	0
Quantities (as shown in FY 1979 submission)	0	0	0	-	0	0

Differences due to erroneous omission of LWCMS figures from FY 1979 submission.

Program Element: #6.46.01.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Lightweight Company Mortar System (LWCMS) consists of an improved 60mm mortar, conventional-style fire control, and high explosive ammunition fuzed with a new multioption electronic fuze. Illuminating ammunition will also be developed. The Lightweight Company Mortar System fulfills the requirement to provide a fire support system at the company level which is manportable. The 47 pound mortar and 2.75 pound round of ammunition weigh less than half the present 93 pound 81mm mortar and nine pound round of ammunition. Nevertheless, lethality effectiveness of the LWCMS equals 70% that of the 81mm mortar per round of ammunition fired. The mortar can be fired out to 1000 meters using a small baseplate and no bipod, or out to 3500 meters using the standard baseplate and bipod. The LWCMS will replace the 81mm mortar at company level in all infantry organizations except mechanized infantry. The illuminating round will fire to a range sufficient to illuminate targets being engaged with the high explosive (HE) cartridge at maximum range (3500 meters). The Battalion Mortar System will provide an improved 81mm mortar capability that has increased range, increased lethality, greater accuracy, and a higher sustained rate of fire than the current 81mm mortar. The new 81mm mortar will fire newly developed ammunition, employing the new multioption fuze, to a range of 5500 meters. The United Kingdom (UK) L16A2, 81mm mortar, already developed and fielded for UK forces is being considered for US use upon successful completion of a detailed evaluation against Army requirements. The system includes a UK barrel and mount, US baseplate and sight, and UK HE projectile with the US multioption fuze. The 81mm smoke screening cartridge will provide greater screening capability.

G. RELATED ACTIVITIES: These developments will also satisfy the US Marine Corps' requirements for a mortar and ammunition. Full coordination of this development with the Marine Corps continues. Program Element (PE) 6.36.08.A, Weapons and Ammunition, LWCMS, supported advanced development of the LWCMS except for the multioption fuze. PE 6.36.13.A, Advanced Fuze Design, supported the advanced development of the multioption fuze, XM/34. PE 6.46.02.A, Field Artillery Ammunition, supported engineering development of the fuze initially until it was transferred to this PE in FY 1974. PE 6.36.13.A, Advanced Fuze Design, supported the advanced development of an electronic time fuze for one year in FY 1978 in order to demonstrate that technology is in hand to provide an electronic time fuze for the LWCMS illuminating round. The UKL16A2 evaluation has undergone feasibility testing under PE 6.57.09.A, Evaluation of Foreign Components.

H. WORK PERFORMED BY: In-house efforts are accomplished by US Army Armaments Research and Development Command, Dover, NJ; and US Army Test and Evaluation Command, Aberdeen, MD. Major contractors are: Eastman Kodak, Rochester, NY; Bergman Manufacturing, Garland, TX; Ruoff, Inc., Runnemede, NJ; Norris Industries, Los Angeles, CA; ITT Research Institute, Chicago, IL; and the United Kingdom Royal Ordnance Factories.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Lightweight Company Mortar System: The basic LWCMS, high explosive round, and revolutionary new multioption fuze were fully developed and type classified standard in July 1977. This system was first procured in FY 1978 with additional procurement in FY 1979. Minor engineering changes to correct shortcomings and deficiencies have been accomplished and tested by Test and Evaluation Command (TECOM). Engineering development work on the 60mm illumination

round and subcaliber training round has continued during this period. Additional Producibility Engineering and Planning (PEP) on the M734 multioption fuze was completed and resulted in lower procurement costs. Smoke Mortar Rounds: To correct the deficiency in smoke screening capability at the battalion level and satisfy the Army requirement, the 81mm smoke screening cartridge development was undertaken. Advanced development on the 81mm smoke round was undertaken in Combat Support Munitions, program element (PE) 6.36.27.A, Smoke Munitions and Material, Project DE82. Battalion Mortar System: Based on a US Army Test and Evaluation Command (TECOM) feasibility test of the UK 81mm L16A2 mortar system in the October 1976 - April 1977 timeframe, it was decided to fully evaluate the UK system as a candidate to fulfill the Improved 81mm Mortar Required Operational Capability (OC). A Secretarial Determination and Findings (D&F) was submitted and approved to procure the necessary mortars and ammunition. A contract was placed with the UK for 18 mortars and 16,700 bombs to conduct development test/operational test (DT/OT) testing. Harry Diamond Labs (HDL) placed a contract with Eastman Kodak to buy M734 multioption fuzes (MOF) to test the adaptation of the fuze to both the US and UK 81mm cartridges. Two UK mortars and 600 rounds of UK XL31E2 ammunition were acquired for use during the M734 MOF compatibility tests. These tests demonstrated the adaptation of the M734 to the UK 81mm mortar cartridge. Tests are continuing with the US cartridges. Arrangements for conversion and delivery of M125A1 carriers were made. Analysis of the mortar tube design and material was conducted by Benet Weapons Lab of Armaments Research and Development Command (ARRADCOM).

2. FY 1979 Program: Lightweight Company Mortar System: This program will be reduced by $1.22 million based on a deletion of the requirement for a 60mm smoke screening round. Smoke Mortar Round: This program will be reduced by $2.744 million due to the decision to delay engineering development pending further study and a decision on the procurement of the UK mortar. Funds will be reprogrammed into other priority efforts. Battalion Mortar System: UK will be funded for the remaining mortars and ammunition to complete the current contract (18 mortars and 16,700 rounds). HDL/Eastman Kodak will deliver the M734 multioption fuzes required for testing. The checked-out and renovated M64 sight will be shipped to the test site. Development Test II, which started in October 1978 at Aberdeen Proving Ground, MD, and Operational Test II are scheduled to evaluate technical data and performance characteristics of the system. These tests will be conducted by TECOM and the Operational Test and Evaluation Agency (OTEA). Following testing and evaluation, a DEVA-IPR will be held to determine if the system meets the ROC requirements and whether or not it should be type classified and procured.

3. FY 1980 Planned Program: Lightweight Company Mortar System: Engineering Development (ED) of the XM745 gutted multioption training fuze will be initiated. All necessary experimental work has been performed and proposed system is ready for full scale development. Fuzes will be produced to support testing for standardization with the M720 cartridge. IOC for the subcaliber training cartridge XM3 will be in second quarter. Smoke Mortar Round: The 81mm smoke screening round is scheduled to start engineering development assuming a decision to procure the Battalion Mortar System. All necessary experimental work will be performed and proposed system will be ready for full scale development. Battalion Mortar System: All elements of ILS will be completed prior to deployment. Shortcomings found during DT II/OT II will be corrected and additional testing conducted if necessary. Mounts for vehicle application will be developed, fabricated, and tested. The Technical Data Package will be prepared, and a Producibility Engineering and Planning effort undertaken to evaluate requirements for US production. Additional ED for an improved 81mm mortar high explosive round will be required to support US production of an 81mm mortar round compatible with the planned procurement of the UK mortar. ED of companion rounds for illumination and training requirements are forecasted.

Program Element: #6.46.01.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

4. FY 1981 Planned Program: Lightweight Company Mortar System: Development test (DT) II of the XM745 multioption training fuze will take place. Fuzes will be produced to support testing for standardization with the M720 cartridge. Smoke Mortar Round: Smoke rounds will continue in engineering development in preparation for DT II/OT II which is scheduled for FY 1983. Battalion Mortar System: If type classified standard, the battalion mortar system is scheduled to be deployed during FY81.

5. Program to Completion: IOC for the XM745 multioption training fuze is planned for 4QFY82. Continued development of the 60mm illumination round is planned. 81mm mortar smoke rounds will be tested and evaluated, with type classification scheduled for 1QFY84.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.02.A
DoD Mission Area: #413 - Fire Support

Title: Weapons and Ammunition
Budget Activity: #4 - Tactical Support

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Addition to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2052	4652	1400	6209	49973	51649
DG21	Tank Ammunition	0	1902	1400	4109	42853	50266
D169	Field Artillery and Tank Fuze Development	77	2400	0	2100	7120	15265
D454	Fuze XM587	1975	350	0	0	0	2331

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program is to develop tank ammunition and fuzes to combat near and future enemy threats by improving terminal effectiveness, accuracy, range, and reliability. This program element supports development of cartridge, 105mm, Target Practice Discarding Sabot-Tracer, XM797. The current 105mm M724 target practice round is designed to match the ballistics of the primary 105mm M392A2 kinetic energy cartridge to a range of 2000 meters. This distance was considered the maximum range for the engagement of armor targets with the M392 round. As a result of the development of the M735 cartridge capable of defeating targets at longer ranges, the XM797 round is required as a companion for the M735 kinetic energy round to provide means for training tank crews in extended range tank gunnery. The development of more accurate electronic fuzes will satisfy the requirement for a more effective use of the antipersonnel round and an efficient use of the increased ranging accuracy which will be provided by modern laser range finders in tanks. Utilizing current electronic technology will increase reliability, and producibility, and will reduce cost compared to the current M571 mechanical time fuzes used with tank-fired ammunition.

C. BASIS FOR FY 1980 RDTE REQUEST: To conduct full-scale Engineering Development for cartridge, 105mm APFSDS-TP-T XM797 used as companion round for M735 family of ammunition. Cartridges will be fabricated for Development Test II/Operational Test II (DT II/OT II) phase. Development and operational testing will be initiated. Refinements in design will be made as dictated by findings as a result of testing.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Cartridge, 105mm, XM797		
DT II/OT II Complete	2QFY81	Not Shown
DEVA IPR, TC-Std	2QFY81	Not Shown

Program Element: #6.46.02.A
DoD Mission Area: #413 - Fire Support

Title: Weapons and Ammunition
Budget Activity: #4 - Tactical Support

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	2052	5552	6477	Continuing	Not Applicable

In FY 1979, reduction reflects movement of funds to higher priority Army systems which necessitated restructuring of the XM742 fuze program. In FY 1980, reduction reflects a delay of new remote set fuzes for 2.75 inch and tank fired ammunition; and the 200-second batteryless electronic fuze from entering engineering development as previously scheduled, and movement of funds to higher priority Army systems.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Procurement of Ammunition, Army						
XM774 Cartridge						
Funds (current requirements) (cost in million $)	0	0	32.2	31.6	105.7	169.5
Funds (as shown in FY 1979 submission) (cost in million $)	0	9.0	58.2	Not Shown	201.8	269.0
Quantities (current requirements)	0	0	72	76	245	393
Quantities (as shown in FY 1979 submission) (000 cartridges)	0	154	96	Not Shown	309	559
XM797 Cartridge						
Funds (current requirements)	0	0	0	0	482	482
Funds (as shown in FY 1979 submission) (cost in millions $)			Not Shown			

Program Element: #6.46.02.A
DoD Mission Area: #413 - Fire Support

Title: Weapons and Ammunition
Budget Activity: #4 - Tactical Support

	FY 1978 Actual	FY 1979 Estimated	FY 1980 Estimated	FY 1981 Estimated	Additional to Completion	Total Estimated Costs
Quantities (current requirements)	0	0	0	0	1,112	1,112
Quantities (as shown in FY 1979 submission) (000 cartridges)			Not Shown			
XM587E2 Fuze						
Funds (current requirements)	0	0	0	9.6	27.9	37.5
Funds (as shown in FY 1979 submission) (cost in millions $)	0	0	6.1	N/A	27.5	33.6
Quantities (current requirements)	0	0	0	100	300	400
Quantities (as shown in FY 1979 submission (000 fuzes)	0	0	50	Not Shown	307	357
XM724 Fuze						
Funds (current requirements)	0	31	48.0	39.4	76.0	195.0
Funds (as shown in FY 1979 submission) (cost in millions $)	0	49.5	60.0	Not Shown	55.8	111.3
Quantities (current requirements)	0	140	400	400	800	1740
Quantities (as shown in FY 1979 submission) (000 fuzes)	0	225	50	Not Shown	631	0

Due to the XM774 not being type classified in 1Q FY 1979 no procurement is planned until FY 1980. Based on studies of their use in intensive combat the procurement quantity has been reduced in comparison to FY 1979 quantities. Cost revisions reflect adjustments. In FY 1980, procurement of the XM587E2 fuze has been curtailed to allow funding of other higher priority Army systems. Cost revisions reflect adjustment changes in procurement profiles of the XM724 fuze reflect a decrease in FY 1979 quantities based on movement of funds to allow funding of other higher priority Army systems. In FY 1980, changes in procurement profiles on the XM724 reflect an increase in ammunition rates based on studies of their use in combat.

Program Element: #6.46.02.A
DoD Mission Area: #413 - Fire Support

Title: Weapons and Ammunition
Budget Activity: #4 - Tactical Support

F. DETAILED BACKGROUND AND DESCRIPTION: The development of improved fuzes is necessary to complement improvement in weapons and ammunition. The present program includes one active project for improved fuzing for artillery and tank ammunition which will be developed under Project D169, Field Artillery Fuze Development. In another project, DG21, Tank Ammunition, development efforts will be conducted for a 105mm target practice round, XM797, a companion for the recently type classified Standard kinetic energy cartridge, M735.

G. RELATED ACTIVITIES: This program is the full scale development follow-on to fuzing efforts supported under Program Element 6.36.13.A, Advanced Fuze Design, and is dependent on technology developed under the Fuze Technology Program, Program Element 6.26.03 Large Caliber and Nuclear Technology. There are no competing fuze programs within the Tri-Services. The efforts being conducted for the tank ammunition are supplemental to the advanced development activities under Program Element 6.36.08.A, Weapons and Ammunition. The Engineering Development program is a continuation of project D161 Advanced Development Program for tank ammunition consisting of the XM797TPDS-T; XM833 APFSDS-T; XM774 APFSDS-T; XM815 HEAT-MP-T; and Multidart Cartridges.

H. WORK PERFORMED BY: In-house agencies include Harry Diamond Laboratories, Adelphi, MD; US Army Armament Research and Development Command (ARRADCOM) Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; Yuma Proving Ground, Yuma, AZ. Contractors include: Honeywell, Minneapolis, MN; Motorola, Incorporated, Scottsdale, AZ; Chamberlain MFG. Corp, Waterloo, IA; Flinchbauch Products Inc., Red Lion, PA; Keunametal Inc., Latrobe, PA; and Teledyne Firth-Sterling, Pittsburgh, PA; National Lead of Albany, Albany, NY.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The development was completed for the artillery proximity fuze, M732, now in production. The development was initiated for an electronic time fuze, XM587E2/XM724; and fuze setter, XM36E1, for artillery ammunition 105mm thru 8-inch. The artillery electronic time fuze program is in final stages of Development Test (DT) II. Thus far, satisfactory results are being achieved. Full-scale development was initiated for an electronic time fuze for beehive ammunition. Development was completed for cartridge, 105mm, armor piercing, fin stabilized, discarding SABOT-tracer, M735. This development was completed and type classified as standard in FY 1977 and is now in production. Full scale Engineering Development of the more advanced XM774 kinetic energy cartridge was initiated for the 105mm tank gun system and when completed will replace the M735 cartridge.

2. FY 1979 Program: Full-scale Engineering Development has been initiated for the XM797 and XM774 105mm cartridges. The XM774 is scheduled to be type classified Standard during 3Q FY 1979. Funding originally scheduled for the development of fuze, XM742, for antipersonnel cartridge reprogramed to support higher priority development efforts. The development of the XM587/XM724 fuzes with XM36E1 fuze setter will be completed and type classified 4Q FY 1979.

3. FY 1980 Planned Program: Engineering Development efforts, fabrication of Development Test II (DT II) hardware, and initiation of Development Test II/Operational Test II (DT II/OT II) phases will be conducted for the XM797 Cartridge. Prototypes will be fabricated, fired, and evaluated. Design will be updated based on test results and additional quantities will be fabricated and subjected to environmental and ballistic testing.

4. FY 1981 Planned Program: Engineering Development (complete DT II/OT II conduct DEVA-IPR, TC-Std) will be completed for the XM797 cartridge. Full-Scale Engineering Development will be initiated for XM833 kinetic energy cartridges; and the XM815 high explosive antitank multipurpose tracer (HEAT-MP-T) cartridge. All necessary experimental work has been performed and the proposed system is ready for full scale development.

5. Program to Completion: The XM833 cartridge will complete Full-Scale Engineering Development (FSED) (DT II/OT II, DEVA-IPR, TC-Std) by end FY 1982; the XM815 cartridge will enter FSED 1Q FY82, with completion planned for 4Q FY 1983. Engineering Development will be initiated for a multipenetrator cartridge for use with the 120mm tank gun.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	10223	16904				
	QUANTITIES	*	*				
D205	Lance Adaption Kit	648	0				
D385	Improved 155mm Nuclear Projectile	2463	13633				
D584	Emergency Disable System	0	0	500	1050	8180	9660
D663	Improved 8-Inch Nuclear Projectile	7112	3271				

* Quantities exceed classification of this document.

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The mission of the Theater Nuclear Force is to deter both nuclear and conventional attack by enemy forces and, should deterrence fail, to support the defense of the theater. This mission requires nuclear weapon effectiveness, response, and control that exceed the capabilities of weapons based on 1950's technology. This program element is the foundation of the program to modernize the Army's theater nuclear weapons by improving the nuclear warheads for the LANCE missile, and the 8-inch and 155mm artillery fired atomic projectiles (AFAP). All these weapons will have a command disable system that will prevent the weapon from being used in its intended mode; however, an Emergency Disablement System (EDS) is required to allow the disablement of weapons currently stockpiled as well as newer weapons when they are threatened by capture from a nontactical stockpile storage configuration. Non-violent disablement is required to prevent plutonium dispersal. EDS is a tri-Service effort lead by the United States Air Force per Office of the Secretary of Defense direction.

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: FY 1980 funds requested will provide for engineering development, design testing, and required design iteration for the fuze, projectile case, and rocket motor for the XM785/W82 Improved 155mm Nuclear Projectile, initial engineering development of an EDS controller, and completion of fuze tester design testing and completion of the second phase of Development Tests/Operational Tests (DT/OT II) for the XM753/W79 Improved 8-Inch Nuclear Projectile.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Improved 155mm Nuclear Projectile Initial Operational Capability		
Emergency Disablement System (EDS) Initial Operational Capability		
Improved 8-Inch Nuclear Projectile Initial Operational Capability		

See more detailed discussion in Descriptive Summary for Project D385, following. The EDS is a tri-Service effort and will probably achieve IOC in the Army with the XM753/W79 first. The XM753/W79 program was halted in DOE by the Byrd-Baker amendment to the FY 1978 DOE appropriations act. A Presidential directive in October 1978 restarted the program but IOC will depend upon the restart capability of DOE production facilities. A firm IOC cannot be determined by DOE before 2Q79.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	8823	16904	20016	30847	108418

Subject to unforeseeable developments as DOE restarts the W70-3 program, all RDTE work on the LANCE Adaption Kit for that warhead was completed in FY 1978. The $1400 thousand increase in FY 1978 over the last submission was for fuze and container redesign work to keep the 8-inch project on schedule less funds that could not be expended in the 155mm project because of DOE delay in initiating their work.

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

Reprograming within this program element in FY 1979 is anticipated. The increase in the FY 1980 estimate is for continuation of the 8-inch project to initiate engineering development of Emergency Disablement System (EDS) hardware and to accelerate the 155mm project to pace the DOE program. The increase in the estimates for FY 1981 plus "Additional to Completion" is for full engineering development of EDS hardware and for a new rocket motor and full engineering development of lethality improvements achievable through design changes made to the 155mm since the FY 1979 submission.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Missile Procurement, Army - LANCE:*						
Funds (current requirements)	3335	799				
Funds (as shown in FY 1979 submission)	4632	876				
Quantities (current requirements)	**	**				
Quantities (as shown in FY 1979 submission)	**	**				
Ammunition Procurement, Army - 155mm:*						
Funds (current requirements)	0	0				
Funds (as shown in FY 1979 submission)	0	0				
Quantities (current requirements)	**	**				
Quantities (as shown in FY 1979 submission)	**	**				

* Department of Defense Nuclear Weapon Components only.
** Warhead quantities exceed classification of this document.

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Ammunition Procurement, Army - 8-inch:*						
Funds (current requirements)	10200	11600				
Funds (as shown in FY 1979 submission)	12300	11600				
Quantities (current requirements)	**	**				
Quantities (as shown in FY 1979 submission)	**	**				
Department of Energy-Defense Programs (DOE-DP) (formerly Energy Research and Development Agency, formerly Atomic Energy Commission)						
LANCE Warhead	***	***	***	***	***	***
155mm Projectile	***	***	***	***	***	***
8-Inch Projectile	***	***	***	***	***	***

* Department of Defense Nuclear Weapon Components only.
** Warhead quantities exceed classification of this document.
*** DOE-DP budget figures exceed classification of this document.

LANCE funds were obligated earlier than had been planned in the FY 1979 submission with the result that the FY 1978, FY 1979, FY 1980, and Total Estimated Costs were reduced by a net of $273 thousand. The "Total Estimated Costs" for 155mm nuclear projectile procurement are based on an earlier acquisition plan and will be adjusted downward to a lower protected stockpile quantity in accordance with the FY 1979 Amended Program Decision Memorandum (APDM). Between the FY 1979 and FY 1980 submission, costs for the 8-inch nuclear projectile were revised are now based on a protected stockpile quantity consistent with the FY 1979 APDM. Protection of a stockpile quantity is achieved by the production of extra units to ensure that the stockpile number is not reduced by the withdrawal of units for quality assurance and reliability testing. Stockpile quantities and the length of protected periods are classified at a level above the classification of this submission.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D385 Title: Improved 155mm Nuclear Projectile
Program Element: #6.46.03.A Title: Nuclear Munitions
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is development of a new, improved 155mm nuclear projectile, the XM785. It will replace the current M454 nuclear projectile

The 155mm nuclear projectile is important

The cost of adding 8-inch units to their force structure is high. A new 155mm projectile in addition to the 8-inch nuclear projectile, will enhance the survivability of the allied tactical nuclear forces by compounding and complicating enemy targeting. The number of nuclear delivery systems will increase by the 2196 dual capable 155mm howitzers planned for the Allied Forces Central Europe force structure. The nuclear capability is an operational bonus because it requires no change in force structure of weapons, communications equipment, and manpower spaces beyond the artillery needs for the conduct of conventional fire missions. The XM785 can be fired from the new US and NATO 155mm howitzers It will take advantage of technology developed in the 8-inch nuclear projectile program in the areas of fuzing, rocket propulsion, and ballistic similitude with conventional ammunition. State-of-the-art technology in large scale circuit integration will be used to reduce component size for packaging the fuzing and safing functions in the smaller projectile volume. Security will be enhanced by use of built-in disablement devices and a Multiple Code Coded Switch (MCCS). The MCCS is a Permissive Action Link (PAL) command and control device with 1 million possible codes, which locks up arming circuits to prevent unauthorized use. It will lock permanently if wrong codes are repeatedly inserted. Activation of the disablement or lock-up of the MCCS will require factory rebuild to permit use of the weapon. The new XM785 will have increase in yield over the M454 that will produce more than a 100% increase in the radius of lethal military effect

At the same time the improved accuracy and the low yield will permit effective employment in the highly populated European environment with targeting constraints designed to limit civilian damage and casualties. Dual capable tube-artillery, because of its mobility, light armor protection, and proliferation on the battlefield, is the most flexible, survivable, and responsive of theater nuclear delivery systems.

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Limited redesign of the LANCE warhead adaption kit to support the in-house production change to the improved version, Mod 3 (reduced blast/enhanced radiation warhead). All studies detailing the Department of Defense (DOD) interface with Department of Energy-Defense Programs (DOE-DP) have been completed. Most of the laboratory and field testing of the Mod 3 warhead and adaption kit was completed. The Nuclear Weapon System Safety Committee review of the W70-3, LANCE Mod 3 warhead, was completed and were completed. Completed final testing and recommended type classification of Army components for the W70-3, LANCE Mod 3 warhead. Because the adaption kit (AK) was compatible with either the W70-3 or other non-enhanced radiation variations, production of the AK was initiated eventhough DOE production of the W70-3 was not begun. The Army provided design support for the projectile main body case for the 155mm nuclear projectile allowing DOE to conduct an of a weaponized nuclear device. See also project D385, Improved 155mm Nuclear Projectile, Descriptive Summary, following. Engineering development of Army components for the Improved 8-inch nuclear projectile have been completed; final development, safety, and proof testing were in progress when the DOE program was halted by the Byrd-Baker amendment.

2. FY 1979 Program: Type classification of all Army components for the LANCE Mod 3 warhead will be finalized. In the 8-inch project, the fuze safety flight tests will be completed, joint DOD-DOE flight tests and firing table flight tests will be initiated and the container and fuze setter will be type classified. Engineering development of the fuze and rocket motor for the 155mm projectile were initiated. See also project D385, Descriptive Summary, following.

3. FY 1980 Planned Program: Engineering development of the 8-inch projectile directed toward program completion will continue at a pace to match the DOE program as restarted. Design engineering flight tests for the 155mm fuze and rocket motor will be initiated. Engineering development of an emergency disablement system (EDS) controller will be initiated and some design engineering tests and safety analysis will be done.

4. FY 1981 Planned Program: All RDTE on the Army components for the 8-inch projectile should have been completed; however, based on the new DOE program schedule, some Army work in FY 1981 may be required. Engineering development for the 155mm projectile components will continue.

5. Program to Completion: This is a continuing program. Achieve Initial Operational Capability (IOC) for the XM753 Improved 8-inch nuclear projectile, the XM785 Improved 155mm nuclear projectile, and an emergency disablement system. IOC for the XM753 and EDS are indeterminate at this time (see discussion in paragraph c, above).

Program Element: #6.46.03.A
DoD Mission Area: #413 - Fire Support

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is modernization of the Army's theater nuclear weapons, principally nuclear projectiles in FY 1980 and the out-years. Engineering development of improved 8-inch and 155mm nuclear projectiles will be accomplished. Major areas of effort by the Army are miniaturization and packaging of arming and fuzing functions, certification of ballistic similitude, and redesign of rocket motor parts. Unique solutions to engineering design problems are required for the 8-inch and 155mm nuclear projectiles. The capabilities of the improved projectiles will include , increasing the area of lethal coverage, improving delivery precision, and simplifying logistic support and operator assembly and testing. These improvements will provide nuclear projectiles that are more effective, more reliable, and more responsive to the dynamics of the modern battlefield. The XM753, 8-inch nuclear projectile will replace the M422 projectile which uses late 1940 nuclear technology. The XM785, 155mm nuclear projectile will replace the M454 projectile
Both the 155mm and 8-inch nuclear projectiles are required to improve the survivability of the theater nuclear weapons by compounding the enemy's targeting of US nuclear capable units and to improve the responsiveness and flexibility of theater nuclear forces by making all cannon artillery dual-capable. The potency of firepower provided by theater nuclear weapons and the bridge to strategic systems they provide are two of the most important elements that deter the Warsaw Pact attack in Central Europe. The Army modernization program improves the deterrent value of Army nuclear weapons and reduces the likelihood of a conflict that would lead to nuclear war. If weapons are threatened with capture by the enemy or terrorists, current disablement capability is limited to violent destruction by shaped charge which spreads nuclear materiel over an area. The new family of Army weapons will all have a command disable system for use on individual weapons in a tactically deployed posture; however, an emergency disablement system (EDS) will be required to provide the capability to disable currently stockpiled weapons, or a number of the newer weapons when in a stockpile storage configuration. Without an EDS, weapon vulnerability to capture is increased when storage bunkers must be opened to emplace demolition charges.

G. RELATED ACTIVITIES: The development of improved nuclear projectiles is a joint Department of Defense (DOD) and Department of Energy-Defense Programs (DOE-DP) undertaking. In addition, the 8-inch nuclear projectile will use the rocket motor developed for the XM650 conventional 8-inch projectile. The XM650 is the conventional ballistic mate that will be used to derive firing data corrections for the XM753. Much of the electronic technology and production expertise developed for the 8-inch fuze will be applicable to the 155mm fuze. EDS development is a tri-Service effort, lead by the Air Force, that relates to all nuclear weapons systems in all Services. All Army nuclear munitions programs are coordinated through the Project Manager for Nuclear Munitions as well as the Army Staff.

H. WORK PERFORMED BY: US Army Research and Development Command (ARRADCOM), Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; Ballistics Research Laboratory, Aberdeen, MD; Department of Energy-Defense Program activities and contractors in Germantown, MD; Albuquerque, NM; Amarillo, TX; Kansas City, MO; Los Alamos, NM; Las Vegas, NV; Livermore, CA. See also project D385, Improved 155mm Nuclear Projectile, Descriptive Summary following.

Project: #D385 Title: Improved 155mm Nuclear Projectile
Program Element: #6.46.03.A Title: Nuclear Munitions
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

B. RELATED ACTIVITIES: The Department of Energy, Defense Programs (DoE-DP) will develop the nuclear warhead. A joint DoE/DoD project officers group will coordinate the integrated DoE/Army development effort. The XM785 will attempt to match the ballistic characteristics of the M549 conventional 155mm projectile. It will also employ fuze technology and rocket motor joint technology developed and engineered for the 8-inch projectile. England, Germany, and Italy have completed development and are now beginning production on a new 155mm howitzer, the FH70, with which the new nuclear projectile will be compatible.

C. WORK PERFORMED BY: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; ARRADCOM, Aberdeen, MD; Department of Energy, Defense Programs laboratories, Lawrence Livermore Laboroatory, Livermore, CA; and the Sandia Laboratories in Livermore, CA.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Subsequent to the Public Works Subcommittee hearings on the FY 1977 Energy Research and Development Agency (now Department of Energy-Defense Programs (DoE-DP)) Appropriation Act, DoE and Department of Defense (DoD) were directed to jointly reassess the 155mm nuclear projectile requirement in light of the approved 8-inch nuclear projectile and the LANCE Mod 3 warhead production. The "155mm Artillery Field Atomic Projectile Modernization Analysis" report was provided to Congress in February 1977. The Army requested DoE-DP participation in a joint engineering development program for an improved 155mm projectile in May 1977 and DoD forwarded the request to DoE in October 1977. DoE accepted the program and began engineering development (Phase 3 for DoE) in February 1978. The Secretary of Defense had directed in his FY 1979 Amended Program Decision Memorandum (APDM) that the Initial Operational Capability date for the improved 155mm nuclear projectile be accelerated.

The Army and DoE pursued an atypical development program that for the 155mm projectile.

Design changes in the nuclear device forced a reduction in the volume available for a rocket motor. The need to develop a new rocket motor, the delay in DoE acceptance of the program, and the push for an early nuclear test caused the Army to change the Initial Operational Capability (IOC).

2. FY 1979 Planned Program: Full engineering development is initiated. Electronic packaging of fuze functions, test firing of high energy rocket propellants, ballistic characterization analyses, interface iteration with DoE, and metallurgical manufacturing processes are all emphasized. The developer's acquisition plan will be formalized and reviewed by the Army Staff in late-FY 1979. Flight testing of prototype fuzes and rocket motors and structural integrity flight testing of DoE components will be conducted.

Project: #D385 Title: Improved 155mm Nuclear Projectile
Program Element: #6.46.03.A Title: Nuclear Munitions
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Major events planned include maintenance evaluation analyses, initial system safety studies by the Nuclear Weapons Systems Safety Committee, and continuation of engineering development of the fuze, container and rocket motor.

4. FY 1981 Planned Program: Department of Energy (DoE) enters production engineering (Phase 4) and the Army initiates Phase II of development testing/operational testing (DT/OT II).

5. Program to Completion: Program completion requires development of Basis of Issue Plans for ancillary equipment, development of technical publications and firing tables, conduct of opertional safety studies, training of logistics and operations personnel, conduct of multiple flight test programs to prove operability and safety, and the provisioning of units for Initial Operational Capability (IOC). Subject to DoE funding capital development in their produciton complex, IOC is planned for late

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Army requested joint Department of Defense-Department of Energy (DoD-DoE) Engineering Development of new 155mm Nuclear Projectile	May 1977	None
OSD forwarded request to DoE	Oct 1977	None
DoE accepted request (Initiated Phase 3)	Feb 1978	Dec 1977
DoE underground nuclear test proves technology		None
In-Process Review (IPR) to approve Acquisition Plan	1QFY79	None
DoE underground nuclear test proves weaponization		None
Begin development testing/operational testing (DT/OT II)	4QFY81	Jan 1981
Development Acceptance IPR	4QFY82	Jan 1981
First DoE Production Unit		None
Type Classify Total System (DoD & DoE components)		None
First War Reserve Hardware Available for DoE		
Initial Operational Capability (IOC)		None

Project: #D385 — Title: Improved 155mm Nuclear Projectile
Program Element: #6.46.03.A — Title: Nuclear Munitions
DoD Mission Area: #413 - Fire Support — Budget Activity: #4 - Tactical Programs

The Major Milestones submitted in FY 1979 were developed before Department of Energy (DoE) had accepted the 155mm projectile program. As discussed in paragraph D.1. and noted in the dates above, engineering development was initiated in 2QFY78. Warhead design changes made in FY 1978 require the Army to develop a new rocket motor for the XM785 that will have a lighter case and a higher energy propellant than the M549 rocket motor. The Army development program could not support an IOC earlier than without making unwarranted exceptions to major acquisition policies. This change in the 155mm nuclear projectile IOC was made to represent a reasonable and achieveable development program and does not reflect a lowering of priority by either the Army or OSD. DoE failure to fund capital equipment expenditures in FY 1980 will force an IOC slip to at least

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	2463	13633				
Funds (as shown in FY 1979 submission)	2878	13633				
Quantities (current requirements)	*	*				
Quantities (as shown in FY 1979 submission)	*	*				
Other Appropriations:						
Procurement Ammunition, Army						
Funds (current requirements)	0	0				
Funds (as shown in FY 1979 submission)	0	0				
Quantities (current requirements)	0	0				
Quantities (as shown in FY 1979 submission)	0	0				

* Quantities exceed the classification of this submission. Overall quantity requirement has not changed from FY 1979 to FY 1980.
** Quantities exceed the classification of this submission. "Total Estimated Cost" is based on a larger stockpile quantity than the Secretary of Defense approved in the FY 1979 Amended Program Decision Memorandum (APDM). A revised Acquisition Plan is being formulated based on the FY 1979 APDM. The revised procurement data will be included in the FY 1981 submission.

Project: #D385 Title: Improved 155mm Nuclear Projectile
Program Element: #6.46.03.A Title: Nuclear Munitions
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

Prior to Department of Energy (DoE) acceptance of the 155mm program, FY 1978 monies were used on other projects in this Program Element (PE). All but $415K were restored by a below threshold reprograming. Changes in the DoE warhead dimensions forced the Army to develop a new rocket motor propellant which is the major cause for the increase in FY 1980. The increase in FY 1981 plus the "Additional to Completion" is for the new rocket motor and to pursue full engineering development of lethality improvements achievable through design changes proven feasible since the FY 1979 submission.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.05.A — Title: Field Artillery Weapons and Ammunition, 105mm
DoD Mission Area: #413 - Fire Support — Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	684	1111	640	6325	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D369	Improved Conventional Ammunition	1	1111	640	6325	Continuing	Not Applicable
D376	Howitzer, Light, 105mm XM204	683	0	0	0	Not Applicable	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for development of 105mm artillery systems and for engineering development of improved conventional munitions (ICM) for all calibers of artillery. A requirement exists to improve the artillery indirect fire support provided by all Army artillery units to help offset the numerical advantage of the Warsaw Pact Forces. A recent Army study and field test results indicate improved fire support will be provided by the substitution of 155mm howitzers for 105mm howitzers in Army light divisions except airborne/airmobile and selected reserve forces. Consequently, 105mm artillery development programs have been essentially terminated. The requirement for improved lethality of all artillery calibers is being met in part by the development of new selected munitions such as the Sense and Destroy Armor Munition (SADARM), an 8-inch projectile, and the random time delay submunition for conventional 155mm and/or 8-inch ICM projectiles.

C. BASIS FOR FY 1980 RDTE REQUEST: To conduct the necessary design evaluation of the M577 fuze with the M509E1 improved conventional munition (ICM) projectile which will allow changes in the technical data package to achieve improved fuze reliability, and eliminate an unnecessary field operation when firing the M509E1 projectile.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	1617	1111	4569	Continuing	Not Applicable

Program Element: #6.46.05.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Weapons and Ammunition, 105mm
Budget Activity: #4 - Tactical Programs

FY 1978 funds were reduced by $933K when the XM710, 105mm ICM projectile was determined not to be cost effective and the development was terminated. FY 1980 funds are reduced as the improved multi-purpose submunition did not enter advanced development in FY 1978 as planned and will not transition to engineering development in this program as originally intended.

E. OTHER APPROPRIATION FUNDS: None.

Program Element: #6.46.05.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Weapons and Ammunition, 105mm
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program consists of one active FY80 Project D369, which supports engineering development of all improved conventional munitions (ICM). In FY80, the performance of the M509E1, 8-inch ICM projectile with the XM577 mechanical time fuze will be evaluated by laboratory and field testing. Earlier testing indicated the M577 fuze reliability was reduced at transonic velocities. Although the exact nature of the problem is not fully understood, it can be eliminated by the installation of a vibration damper in the field when firing. Following testing, necessary design changes to improve fuze functioning reliability and to eliminate the need for a vibration damper will be developed and incorporated into an amended technical data package. A new munitions concept, the random time delay submunition which is under development in P.E. 6.36.28, Field Artillery Ammunition will enter engineering development in this program commencing in FY81. Prior year programs supported the M204, a 105mm howitzer which completed development and was type classified standard, as well as the XM710, 105mm ICM projectile which was terminated in FY78.

G. RELATED ACTIVITIES: These items were developed from exploratory development and advanced development research conducted under Program Elements 6.26.03.A, Large Caliber and Nuclear Technology, and 6.36.28.A, Field Artillery Ammunition.

H. WORK PERFORMED BY: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; Watervliet, NY; and Rock Island, IL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The M204 howitzer entered engineering development in FY 1973 and successfully completed development in 1978. One weapon was shipped to Australia in 1976 to participate in an Australian Standardization loan and tropic tests. A development acceptance in-process review (DEVA-IPR) was conducted in 1978 and the howitzer was type classified standard. Due to the planned conversion of 105mm artillery units to 155mm units, no procurement is planned for the M204 howitzer. The XM710, 105mm ICM projectile and the XM200 propelling charge entered engineering development in 1974, and in 1978 were terminated. The XM710 projectile was optimized as an antipersonnel munition and was not cost effective against the projected threat. The XM200 charge provided extended range in the M204 howitzer only, and was therefore not procured. The M622 HEAT cartridge completed development and was type classified in FY 1978.

2. FY 1979 Program: Procure sufficient M509E1 projectiles, related hardware and laboratory test fixtures to conduct engineering tests of the M509E1 with the M577 fuze, to determine the exact cause of the reduced fuze reliability.

3. FY 1980 Planned Program: To continue the effort initiated in FY 1979 to improve the M577 fuze to simplify field operations when used with the 8-inch ICM projectile, M509E1, and conduct laboratory and firing tests. Complete the engineering effort and amend the technical data package as warranted.

4. FY 1981 Planned Program: Initiate engineering development of the random time delay submunition which was developed in Program Element 6.36.28.A, Field Artillery Ammunition. All necessary experimental work will be performed and the proposed system will be ready for full scale development.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.06.A — Title: Explosive Demolitions
DoD Mission Area: #413 - Fire Support — Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	870	2063	289	1900	Continuing	Not Applicable
	Quantities						Not Applicable
D021	Explosive Demolitions	870	2063	289	1900	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for the development of explosives and devices for general tactical demolitions missions, special purpose items for general Army and Special Forces use, equipment for US Army Technical Escort, and Army peculiar tools and kits for Explosive Ordnance Disposal (EOD) units. Demolitions are used to assist in the rapid creation of obstacles to enemy movement and to aid friendly mobility by clearing enemy obstacles and debris. Technical escort provides for the safe movement of potentially hazardous munitions. EOD units provide a capability to neutralize the hazards existing in explosive ordnance because of unusual circumstances which present a possible threat to operations, installations, personnel, or materiel. Specific projects in this program include: Blasting Agent, a two-part field mixable explosive for cratering and general purpose engineer demolition work; hard overpack, a container for moving leaking chemical munitions to areas where the leaker can be neutralized; the M180 cratering charge, an item which reduces the cratering sequence to a one phase action; and the M122 firing device, a long range remote-control demolition charge detonation device.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds are required for Developmental Testing II/Operational Testing II (DT II/OT II) and type classification of the hard overpack for chemical munitions.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	95	2063	2115	Continuing	Not Applicable

Program Element: #6.46.06.A
DoD Mission Area: #413 - Fire Support

Title: Explosive Demolitions
Budget Activity: #4 - Tactical Programs

In FY 1978, increase in funds reflects a reprograming to support the blasting agent in response to Army priorities and the expedited nature of the development. In FY 1980, the decrease represents movement of funds to support higher priority requirements and lack of approved requirements documents. Remaining funds support the hard overpack for leaking chemical munitions.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Ammunition Procurement, Army (M180)						
Funds (current requirements)	2800	1800	1800	1800	7600	14000
Funds (as shown in FY 1979 submission)	2800	1800	1800	1800	7600	14000
Quantities (current requirements)	1000	1000	1000	1000	4000	8000
Quantities (as shown in FY 1979 submission) (kits ea.)	1000	1000	1000	1000	4000	8000
Ammunition Procurement Army (Blasting Agent)						
Funds (current requirements)			3800	3800	12,500	20100
Funds (as shown in FY 1979 submission)			New Requirement			
Quantities (current requirments)			2000	2000	6000	10000
Quantities (as shown in FY 1979 submission) (1000 # kits)			New Requirement			

Program Element: #6.46.06.A
DoD Mission Area: #413 - Fire Support

Title: Explosive Demolitions
Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: In recent years, this program has provided development support for three functions performed by the Army. In the area of tactical demolitions, simple firing devices for explosives have been developed with the goal of increased reliability and a reduction in size and weight. Items have been developed to assist Explosive Ordnance Disposal (EOD) personnel in the neutralization of hazardous munitions. This requirement is continuous because of the introduction of new items into the inventory and the acquisition of foreign items for both friendly and enemy sources. Since the development of joint-Service EOD items has been assumed by the Navy, this program supports Army peculair developments and integration of Navy-developed items into the Army system. Special purpose items for US Army Tehcnical Escort are developed as required to assist in the movement of hazardous munitions.

G. RELATED ACTIVITIES: Joint Service EOD items are funded and developed by the Navy as the single manager for EOD items in Program Elements 6.36.54.N and 6.46.54.N, EOD Equipment. Efforts on adaptation of commercial explosives (blasting agents) for military application proceeded from advanced development in Program Element 6.36.19.A, Countermine and Barriers and the Corps of Engineers Military Adaptation of Commercial Explosives (MEACE) program.

H. WORK PERFORMED BY: The principal Army agencies responsible for this program are the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, and the Chemical Systems Laboratory, Aberdeen Proving Grounds, MD. EOD devices are developed by the Naval Explosive Ordnance Disposal Facility, Indian Head, MD. Principal contractor is IRECO Chemical Company, Salt Lake City, UT.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Standardized items developed in this program include an overhead foxhole cover. The M252 cutting and entry tool kit for access to munition fuzes, the general purpose barbed tape obstacle, and the M180 cratering charge for hasty road craters. In FY 1977, the M122 remote firing device was type classified and limited production initiated. Efforts continue on the bulk explosive (blasting agent) system to assist in the rapid creation of obstacles. The vehicle mounted explosive container for transport of hazardous explosive items to safer areas, and the hard overpack to contain leaking chemical munitions were initiated. During 1978, Developmental Testing (DT) DT II on the blasting agent was initiated. Engineer design tests on the hard overpack were conducted. The vehicle mounted explosive container was tranferred to Navy EOD for development.

2. FY 1979 Program: Complete Developmental Testing/Operational Testing II (DT/OT II) on the blasting agent and type classify standard. Initiate DT II/OT II on the hard overpack. Initial procurement on the M180 cratering charge and the M122 firing device continues.

3. FY 1980 Program: Initiate production on the blasting agent. Complete DT II/OT II and type classify the hard overpack. Field the M180 cratering charge and the M122 firing device.

4. FY 1981 Planned Program: Field the blasting agent. Initiate production on the hard overpack. Initiate efforts on the Variable Time Firing Device and other special purpose demolition items.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.08.A
DoD Mission Area: #412 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1000	1575	1460	100	0	4857
	Quantities						Not Applicable
DF21	NATO Small Arms Evaluation	1000	1575	1460	100	0	4857

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides US support (both financially and technically) for the NATO Small Arms Test/Evaluation which has been agreed to by eleven NATO countries in a Memorandum of Understanding (MOU). The purpose of this test is to select and recommend a second standard caliber of small arms ammunition (7.62mm is now standard) and possibly a standard weapons system.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds US share (approximately 27%) of expense for the international NATO Test Control Commission (TCC), which has been established for the conduct and evaluation of the results of these tests. Pays expenses of two US permanent members assigned to the international TCC. Provides technical assistance and resources to assist TCC in analyzing and evaluating test results from all three test sites and assists in preparation and assembly of combined test data upon which to base a recommendation. Allows monitoring of raw test data in US to assist US members of TCC in daily decisions and insures US Army has sufficient data to confirm NATO's selection of a new standard caliber of ammunition and recommended weapon.

	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Start	Ammunition Technical Testing	1 Apr 77	1 Apr 77
Complete	Ammunition Technical Testing	May 79 1/	Sep 78
Start	Weapon System Technical Test	1 Apr 77	1 Apr 77
Complete	Weapon System Technical Test	Jun 79 1/	Mar 79
Start	Military Test	Jun 78	Jun 78
Complete	Military Test	Jun 79	Jun 79
Start	Report Preparation	1 Jul 79	1 Jul 79
Report Due to NATO Headquarters		15 Jan 80	15 Jan 80

1/ Completion dates for ammunition test and weapon system test have been extended to allow for better utilization of resources (manpower and facilities) and allow for additional testing if a candidate system experiences problems.

Program Element #6.46.08.A
DoD Mission Area: #412 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 and FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	1000	1575	1460	0	4757

Additional $100 thousand in FY 1981 completes US implementation of the NATO recommendation.

E. OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.46.08.A
DoD Mission Area: #412 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program element (PE) supports a Memorandum of Understanding (MOU) signed by eleven NATO countries, including US, for testing, evaluation and selection of a second NATO standard caliber of small arms ammunition. Testing is directed by an international Test Control Commission (TCC) and designed to select a second NATO standard caliber of small arms ammunition and possibly a standard weapon system. Technical tests began on 1 April 1977 at Cold Meece, United Kingdom (UK), and Meppen, Federal Republic of Germany (FRG). Military tests began in June 1978 at Hammelburg, FRG. Final test reports are due in NATO Headquarters 15 January 1980. The US is committed to adopt the second NATO standard cartridge.

G. RELATED ACTIVITIES: This project represents the primary source of military small arms engineering development for all Services. Other Service representatives attend ad hoc coordinating meetings. Activities in PE 6.36.07.A, Army Small Arms Program, have been coordinated with this PE to insure maximum NATO standardization; i.e., the Army squad automatic weapon will not enter production until the NATO decision is made on the second standard caliber of small arms ammunition.

H. WORK PERFORMED BY: NATO small arms test is being completed under the direction of an international staff. US in-house efforts are accomplished by the US Army Armaments Research and Development Command, Dover, NJ; US Army Operational Test and Evaluation Agency, Falls Church, VA; Lake City Arsenal, Independence, MO; Army Material Systems Analysis Activity, Human Engineering Laboratory, Chemical Systems Laboratory, Ballistic Research Laboratory, and US Army Test and Evaluation Command, Aberdeen Proving Ground, MD.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Coordination was conducted to prepare an international Memorandum of Understanding (MOU) for the establishment of an organization to control the NATO small arms test and evaluation. Initial planning for the type of tests to be conducted at the various test sites was completed. US nominated the M16A1 rifle and 5.56mm (XM777 and XM778) cartridges as standardization candidates. Technical test on the candidate ammunition and weapon system began at Cold Meece, United Kingdom (UK), and Meppen, Federal Republic of Germany (FRG), began on 1 April 1977. In June 1978 a one-year operational test for the various weapon systems using troops from six different NATO countries began at Hammelburg, FRG.

2. FY 1979 Program: Testing at all three NATO test sites will be completed in the third quarter of 1979. A international group of results analysis experts, under the supervision of the TCC, will initiate the analysis and evaluation of the raw test data from all three test sites. US expert technical assistance and advice will be provided to the two US permanent members of the TCC to assist in the supervision of the tests and the initiation of the analysis and evaluation of raw test data.

Program Element: #6.46.08.A
DoD Mission Area: #412 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Funds US share of FY 1980 expense for Test Control Commission (TCC) to analyze test data from three test sites, evaluation of test results and prepare recommendation for NATO. Provide US assistance in preparation and assembly of combined test data upon which to base a recommendation. Monitor raw test data in US to insure the US Army has sufficient data to confirm NATO's selection of a new standard caliber of ammunition and a possible weapon recommendation. Provide assistance to TCC in preparation of after action report of lesson learned for future use by NATO. Complete report to NATO HQ recommending the second NATO standard caliber of ammunition and a possible weapon for post 1980. Initiate US implementation of NATO recommendation.

4. FY 1981 Planned Program: Complete US implementation of NATO recommendation of a second standard caliber of Small Arms Ammunition.

5. Program to Completion: No planned program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.09.A
Title: Combat Support Systems
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2720	2248	1028	3168	Continuing	Not Applicable
	QUANTITIES						Not Applicable
DF96	Tactical CS Agent Munitions	0	500	0	1147	Continuing	Not Applicable
D191	Smoke Munitions and Material	2131	1748	1028	2021	Continuing	Not Applicable
D618	Civil Disturbance Control System	589	0	0	0	0	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the engineering development (ED) support for developing new and improved smoke munitions and systems and more effective riot control agent munitions/devices for tactical and civil disturbance use. Adequate tactical protection of armored vehicles requires that they possess the means to rapidly and effectively obscure the enemy's surveillance and thus interfere with his weapons acquisition, aiming and guidance capabilities. Armored vehicle on-board smoke screening systems being developed will provide the only rapid response protection systems that meet this requirement. In the riot control munitions area it is necessary for tactical forces to have the capability of employing riot control agent (agent CS) under battlefield conditions for such purposes as separating hostile from friendly personnel. To fulfill this requirement, munitions must be developed for use by tactical forces under battlefield conditions.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds are required to continue rapid smoke grenade launcher development for other tactical vehicles such as self propelled artillery, self propelled air defense systems, and to complete value engineering design efforts and initiate Development Test (DT) II/Operational Test (OT) II testing, to complete validation and adaptation studies of the vehicle engine exhaust smoke system (VEESS) to the M60, M60A2, and M48A5 tanks, AVLB, M728 CEV and M88A1 MRV, and to continue development of VEESS on other armored vehicle engines.

Program Element: #6.46.09.A
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare

Title: Combat Support Systems
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	2520	2248	3565	Continuing	Not Applicable

Department of the Army priorities for tactical and civil disturbance riot control agent (RCA) systems are not high enough to provide this area an allocation of limited RDTE funds in FY 1980. As a result, the $2057K for DF96 in FY 1980 was deleted from this program. Excellent progress has been made in adapting smoke grenade launcher systems and vehicle engine exhaust smoke systems to the various US Army combat vehicles and as a result $1028K rather than $1508K is sufficient to accomplish the planned program in FY 1980.

E. OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.46.09.A Title: Combat Support Systems
DoD Mission Area: #449 - Chemical and Biological Defense/ Chemical Warfare Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program supports the development of rapid smoke protection for US armored vehicles to include the following: application of the M239 rapid smoke grenade launcher to M60, M60A2, XM1 and M485A tanks, M728, and M88A1, development of a 4-tube discharger, grenade launcher system for application to the Infantry Combat Vehicle, Improved TOW Vehicle, SLUFAE, DIVAD Gun Carrier, and other combat vehicles. Additionally, a vehicle engine exhaust smoke system (VEESS) for M60A1/A3 tanks and other US diesel-driven armored vehicles is being developed which will complement the rapid smoke grenade launcher system. The other objective of this program is to develop new and more effective riot control agent munitions, devices and equipment for both tactical use and for controlling civil disturbances.

G. RELATED ACTIVITIES: The Army is the Department of Defense (DOD) Executive Agent for development of civil disturbance control systems. The other Services sponsor engineering development for materiel unique to each. Liaison personnel from each Service monitor the developing agencies programs and joint committees meet regularly to review Service needs and insure development programs are oriented to satisfy joint needs. This program is supported by Program Elements 6.26.22.A, Chemical Munitions and Chemical Combat Support; and 6.36.27.A, Combat Support Munition. Project D191, Flame and Smoke Weapons and Equipment, was originally part of Program Element 6.46.01.A, Infantry Support Weapons.

H. WORKED PERFORMED BY: The Smoke Systems program is managed by the Project Manager - Smoke/Obscurants. Approximately 80% of the armored vehicle protection systems effort will be in-house by US Army Chemical Systems Laboratory, Edgewood, MD; and 20% will be the test effort of the US Army Test and Evaluation Commands, Aberdeen Proving Ground, MD. Fifty percent of the vehicle exhaust smoke generating system will be in-house by the US Army Chemical Systems Laboratory, Edgewood, MD; and 50% will be contractual effort with Teledyne Continental Motors Corporation, Muskeegon, MI. Other efforts supporting this program will be conducted by US Army Test and Evaluation Command, Aberdeen, MD; Pine Bluff Arsenal, AK; and US Army Large Caliber Weapons Systems Laboratory, Dover, NJ; Miller Research Corporation, Baltimore, MD; and Battelle Corporation, Columbus, OH.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Numerous tactical CS munitions and civil disturbance control munitions and devices completed development and were type classified under this program element. Examples include: M629, 105mm Tactical CS projectile; M630, 4.2 inch Tactical CS projectile; M651, 40mm Tactical CS Cartridge; a 2.75 inch CS air-to-ground rocket; M165 Multipoint Source Cluster; and the M674 Riot Control Agent Cartridge. Engineering development was initiated on several other civil disturbance control devices: XM33 riot control agent dispenser; XM47 CS filled grenade and XM32 hand held CS dispenser for use by military police units. Engineering development continued on the XM96, 66mm Tactical CS rocket. Emphasis was on improving producibility of the warhead and increasing the agent payload. In FY 1974 the M47 CS grenade and M48 training grenade completed development and were adopted as standard. The M47 grenade was a significant improvement because its spherical shape and skittering characteristics minimize the possibility that rioters can throw the grenade back at the crowd control unit. The M33 Portable, backpack dispenser was adopted for use with CS. Engineering development was initiated on the XM742 Projectile (SOFT

RAG) in FY 1976. Concept feasibility testing, user testing and type classification of the M239 launcher (6-tube) and L8A1 Smoke Grenade for M60A1/A3 Tanks were completed in FY76 along with the initiation of design for a 4-tube launcher for other types of armored vehicles. During FY 1978, the US Tank Units in Europe received approximately 600 of the recently type classified M239 rapid smoke grenade launcher systems. The initial fielding plan which called for issuing 1291 M239 systems to US Army forces in Europe for application to M60A1 tanks was completed in December 1978.

2. FY 1979 Program: Complete user testing and type classification of the XM243, XM250 and XM257 rapid smoke grenade launchers. Initiate value engineering program to redesign the M239 launcher dischargers to reduce the weight, develop interchangeable basis and lower the cost. Coordinate with PM-M60 for fielding of the vehicle engine exhaust smoke system (VEESS) on M60A1/A3 tanks. Initiate validation and adaptation programs of the VEESS to the M60, M60A2, M48A5 tanks, AVLB, M728 CEV and M88A1 MRV vehicles. Initiate contracts to investigate feasibility of a VEESS for the Detroit, Cummings and other diesel engines used on combat vehicles.

3. FY 1980 Planned Program: Continue launcher development for follow-on vehicle requirements. Complete value engineering design effort on 6 tube discharges and initiate DT II/OT II testing. Complete validation and adaptation studies of the vehicle engine exhaust smoke system (VEESS) to the M60, M60A2 and M48A5 tanks, AVLB, M728 CEV and M88A1 MRV. Continue development on a VEESS for other vehicle diesel engines.

4. FY 1981 Planned Program: Continue launcher development/adaptation engineering efforts for add-on vehicle requirements. Provide testing hardware for other diesel engines and initiate tests on tracked vehicles using engines of lower horsepower, lower mass air flow and different configurations than the M60 series engine. Initiate ED for a manportable smoke/obscurants generating system.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.12.A
Title: Countermine and Barriers
DoD Mission Area: #416 - Land Mine Warfare
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4944	9738	4593	5500	Continuing	Not Applicable
	Quantity						Not Applicable
D145	Surface Launched Unit, Fuel-Air Explosive (SLUFAE)	3818	5067	2000	1000	0	16927
D300	Countermine and Barriers (NATO)	0	0	1200	800	0	2000
D415	Mine Neutralization/Detection	1126	4671	1393	3700	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Warsaw Pact doctrine specifies the habitual use of minefields during both offensive and defensive operations. Historically, minefields have been proved to be effective combat multipliers used primarily in the defense. Defensive minefields are selected to take advantage of natural obstacles and to stop or canalize attacking forces. Mines are used offensively for flank protection of advancing formations to deny access to vital terrain and routes of communications. Warsaw Pact can emplace minefields rapidly by mechanical means. Capability to counter this mining threat by US Forces is extremely deficient. Current capability consists of hand-held detectors which require a slow point-to-point search and then manual or explosive mine neutralization. The delay to friendly forces associated with these techniques significantly raises the potential for enemy success. This program provides for the engineering development of a group of mutually supporting mine detection and neutralization devices capable of defeating mines and booby traps which support enemy positions, on lines of communications, and in off-route environments. Priority is placed on development of detection/neutralization devices and systems which allow friendly forces to maintain the momentum of the attack by rapidly breaching enemy minefields and negating their barrier potential. This program also supports the development of field fortification techniques and equipment. US defensive posture in Europe makes it essential that US Forces in position survive threat weapons and create these positions within the prescribed time frame. This program supports the establishment of formidable defensive positions in support of a strong point.

Program Element: #6.46.12.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1980 RDTE REQUEST: Funds will support completion of Developmental Testing II/Operational Testing II (DT II/OT II) on SLUFAE, (Surface Launched Unit, Fuel Air Explosive) compilation and analysis of test data, and type classification standard for Army use. The SLUFAE technical data package will be assembled, new equipment training team will be fielded, skill performance aids package will be completed, and production initiated. Engineering Development (ED) on the vehicle mounted road mine detector will be initiated. Initiate ED of a static, dug in, overhead cover for the tube-launched, optically tracked, wire guided antitank missile system (TOW). Test the British GIANT VIPER Mine Neutralization System.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE					
Funds (as shown in FY 1979 submission)	4756	9738	15,586	Continuing	Not Applicable

In FY 1978, difference in funds reflects a minor adjustment between program estimates and actual expenditures. In FY 1979, difference represents a minor adjustment in view of program progress in FY 1979. In FY 1980, significant reduction reflects failure of advanced development programs to progress to engineering development in the timeframe anticipated and the movement of funds to higher priority Army requirements.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Ammunition Procurement, Army (SLUFAE)						
Funds (current requirements)	0	0	8900	50900	145700	205500
Funds (as shown in FY 1979 submission) (rounds each)	0	6000	41500	--	70800	118300
Quantities (current requirements)	0	0	2100	18000	52577	72677
Quantities (as shown in FY 1979 submission) (rounds each)	0	1400	18000	--	35596	54996

Program Element: #6.46.12.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Other Procurement, Army (SLUFAE)						
Funds (current requirements)	0	4400	0	12400	9300	26100
Funds (as shown in FY 1979 submission) (launchers)	0	4400	9200	--	15300	28900
Quantities (current requirements)	6	60	0	155	112	327
Quantities (as shown in FY 1979 submission) (launchers)	0	60	120	--	190	370
Weapons and Tracked Combat Vehicles						
Funds (current requirements)	0	3900	12400	10000	0	26300
Funds (as shown in FY 1979 submission) (M548 each)			Not Shown			
Quantities (current requirement)	0	40*	120	97	0	257*
Quantities (as shown in FY 1979 submission) (M548 each)			Not Shown			
Other Procurement, Army						
Funds (current requirement)	0	0	5400	6400	4800	16600
Funds (as shown in FY 1979 submission) (transporter/loader)			Not Shown			
Quantities (current requirements)	0	0	60	155	112	327
Quantities (as shown in FY 1979 submission) (transporter/loader)			Not Shown			

* Additional 70 M548 to be diverted from inventory.

Changes in the SLUFAE rounds profile reflect an increase in per item cost based on fuze and detonator improvements to increase reliability and an increase in the Authorized Acquisition Objective (AAO) generated by recent rate studies. Changes in launcher profile reflect adjustments due to a slip in the program due to technical difficulties and a reduction in the number of launchers required. M548 profiles have been structured to support launcher procurement. Transporter/loader has been added to the system based on a change to the logistic support concept.

Program Element: #6.46.12.A
DoD Mission Area: #416 - Land Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Providing effective countermeasures to landmines continues to present a significant challenge to the Army developer. In recent years, efforts have been directed towards devices to perform both hasty and delibrate breaches. Breaching must take place while under fire as well as more benign environments. Two distinct activities must be addressed in this program, mine detection and neutralization. The preponderance of developmental effort has been directed towards hasty minefield neutralization and breach with minimum impact on the momentum of the attack. The Surface Launched Unit, Fuel-Air Explosive (SLUFAE) mine neutralization system has been designed to provide a rapid standoff breach of a minefield up to 300 meters in depth. SLUFAE is simple to employ and intended for use by combat engineers as part of the combined armor-infantry team. SLUFAE is scheduled for type classification standard and initial production during FY 1980. A major effort in this area, the mineclearing roller, will provide tank units with an integral capability to negate minefield effectiveness. The roller can withstand 2 to 3 direct blasts from threat mines, maintain its integrity, and protect the tank from damage. The mine roller was type classified in FY 1978 with initial procurement in FY 1979. Follow-on systems in this program will include: evaluation of British GIANT VIPER projected line charge to accomplish both explosive neutralization of mines and NATO standardization; and a vehicle mounted road mine detector to rapidly sweep lines of communications. In the area of field fortifications, the Army has increased emphasis on battlefield survivability as a result of various analyses on the effects of modern weapons. Fortification measures include clearing fields of fire, digging weapon emplacements and positions for personnel, strengthening natural obstacles, installing artificial obstacles, and providing camouflage.

G. RELATED ACTIVITIES: Developments in this program element (PE) follow from advanced development (AD) efforts in PE 6.36.19.A, Countermine and Barriers. Army countermine efforts are closely coordinated with the Project Manager (PM) for Selected Ammunition, Dover, New Jersey, who is responsible for the development of mine fuzes, sensors, kill mechanisms, and logic in PE 6.36.06.A and 6.46.19.A, Landmine Warfare. The Army has significantly reduced the cost and developmental effort on Surface Launched Unit, Fuel-Air Explosive (SLUFAE) by utilization of Navy-developed fuel-air explosives and rocket technology. The Army continues to monitor the joint Fuel-Air Explosive (FAE) II program. Available Navy in-house capability has been used to produce developmental hardware. US continues to monitor RDTE efforts of foreign nations particularly NATO for technological breakthroughs in the detection and neutralization of landmines.

H. WORK PERFORMED BY: The US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, in assigned responsibility for the Army Countermine and Barriers program. In-house support is provided by: Naval Weapons Center, China Lake, CA; Naval Surface Weapons Center, White Oak, MD; US Army Test and Evaluation Command, Aberdeen, MD; Yuma Proving Ground, Yuma, AZ; and the US Army Missile Research and Development Command (MIRADCOM), Huntsville, AL. Contractors include: Honeywell Corporation, Hopkins, MN; Lanson Industries, Cullman, AL; Chrysler Corporation, Detroit, MI; Cubic Corporation, La Jolla, CA; and Martin-Marietta, Orlando, FL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: In FY 1975 a track-width mine plow was developed from a Soviet design but was terminated because of blast vulnerability. The Fuel-Air Explosive, Helicopter Delivered (FAESHED) was terminated and not procured due

helicopter vulnerability. During FY 1976, initial SLUFAE prototype items were fabricated and engineering design tests were conducted against a live minefield. In FY 1977, SLUFAE Development Test (DT) II/Operational Test (OT) II launcher hardware and initial prototype rounds with electronic fuzes were procured. SLUFAE reliability, availability, and maintainability (RAM) tests and logistic support concept tests were conducted. Expedited development of a mine clearing roller was initiated. During FY 1978, the mine clearing roller was type classified standard and production initiated. Artic and tropic testing on the SLUFAE was completed and the compilation of the SLUFAE technical data package was initiated.

2. FY 1979 Program: Complete DT II/OT II on SLUFAE. Complete SLUFAE skill performance aids (SPA's) and prepare materials for the new equipment training team. Initiate engineering development (ED) on the vehicle mounted road mine detector. All necessary experimental work on the detector has been performed and the proposed system is ready for full scale development. Initiate ED on an overhead protective shelter for troop positions. Conduct performance tests on the British GIANT VIPER to determine acceptability for integration into US units and NATO standardization.

3. FY 1980 Planned Program: Type classify the Surface Launched Unit, Fuel-Air Explosive (SLUFAE) Mine Neutralization System and initiate production. Continue engineer design tests on the Vehicle Mounted Road Mine Detector. Continue testing the British GIANT VIPER mine neutralization system. Continue efforts on protective shelters for troop positions. Initiate ED on protective emplacements for command and control facilities and field artillery and aviation units. Initiate ED on a lane widening and minefield proofing trailer to assist in minefield breaching. All necessary experimental work will be performed and the proposed systems will be ready for full scale development.

4. FY 1981 Planned Program: Conduct SLUFAE production acceptance test and field the new equipment training team. Initiate fielding of the SLUFAE system. Conduct DT II/OT II on the Vehicle Mounted Road Mine Detector. Complete evaluation of the British GIANT VIPER System. Type classify the troop protective shelter. Continue testing addition protective shelters. Conduct DT II/OT II on the lane and minefield proofing trailer. Initiate ED on the portable mine neutralization system (POMINS). All necessary experimental work will be performed and the proposed system will be ready for full scale development.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.14.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Weapons and Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2202	10535	7133	4910	Continuing	Not Applicable
	QUANTITIES	(Not feasible to list due to number of diverse items)					
D373	Ammunition Cannon, 155mm	1503	8170	5233	2110	Continuing	Not Applicable
D379	Howitzer, Medium, 155mm XM198	699	1965	0	0	0	
D286	Field Artillery Ammunition (NATO)	0	400	1900	2800	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports development of 155mm Field Artillery Weapons and Ammunition to provide increased lethality, range, accuracy, reliability, and speed in delivering fires to offset the numerical advantage of the Warsaw Pact Forces. A new high explosive projectile will provide a significantly increased range and lethality to standard artillery weapons. A new family of propelling charges will reduce the number of charges in the field, reducing logistics requirements, and provide improved accuracy. When coupled with new fire control computer and target locating devices, this will allow accurate first round fire for effect artillery support. This will provide increased fire power to the Army mechanized and armored divisions, and will increase the capability of the highest density weapon system in NATO.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds requested provide for development of: a new propelling charge, the XM211; a new high explosive projectile, XM795; a new smoke projectile; continuation of ammunition compatibility testing with the M198 howitzer; and evaluation of the Trilateral (United Kingdom, Germany, Italy) nations newly developed projectiles and charges with US 155mm howitzers.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	3495	10535	10468	Continuing	Not Applicable

Program Element: #6.46.14.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Weapons and Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

FY 1980 funds are reduced as the XM201 propelling charge was found to produce excessive tube wear and erosion and development was suspended. FY 1978 funds were reduced as funds for the improved smoke projectile were reprogrammed to complete advanced development into PE. 6.36.28.A Field Artillery Ammunition.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	0	7500	9900	34700	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	20300	73200	-	488900	588500
Quantities (current requirements) (in thousands)						
M203	0	50	59	137	Continuing	Not Applicable
M211	0	0	0	246	Continuing	Not Applicable
Quantities (as shown in FY 1979 submission)(in thousands)						
M203	0	117	117	-	348	628
XM211	0	0	85	-	1951	2036
XM201	0	0	360	-	2100	2460
Weapons & Tracked Combat Vehicles						
Funds (current requirements)	0	28800	54700	14900	0	131400
Funds (as shown in FY 1979 submission)	100	32100	61300	-	25900	152900
Quantities (current requirements)	0	107	208	50	0	435
Quantities (as shown in FY 1979 requirements)	0	107	208	-	83	468

The FY 1978 funds $100(K) was for initial provisioning spare resquirement which was not executed. Differences in FY 1979 and FY 1980 are due to reduction in cost estimates for carriages and fire control. In FY 1980, $1.3M was deleted for initial provisioning spares. Change in FY 1981 howitzer procurement was due to changes in force structure requirements.

Program Element: #6.46.14.A
DoD Mission Area: #413 - Fire Support

Title: Field Artillery Weapons and Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: A requirement exists to increase the indirect fire capability of field artillery cannon units by providing improved howitzers and ammunition. This program provides for the development of the XM211 low zone propelling charge, the XM795 high explosive projectile, and the XM825 smoke projectile. The XM 211 charge will replace two standard charges, which will reduce the number of charges required to provide the full range capability to the 155mm system. The XM795 projectile is being developed using high fragmenting steel to provide significantly increased lethality and a 23% range increase over the standard high explosive projectile. Both the charges and projectiles are in agreement with ballistic parameters contained in a Memorandum of Understanding signed in 1978 between the United States and three European Nations, Germany, Italy and the United Kingdom. The M198, 155mm howitzer was developed to meet the requirement for towed medium artillery with a range of 30 thousand meters. This increased range will enable our medium artillery to be competitive with and survivable against the present Soviet 130mm field gun M46 (25 thousand meters). Project D286 provides for compatibility testing of newly developed NATO weapons and munitions with US howitzers and ammunition. The trilateral nations (UK, GE, IT) have developed the FH70, towed 155mm howitzer, a new family of propelling charge and a new high explosive projectile, the L15. All of these items are in agreement with the ballistic parameters in the MOU mentioned above. Testing to demonstrate compatibility/interchangeability will commence in FY 1979 consistent with availability of test items.

G. RELATED ACTIVITIES: This program is the normal engineering development program for advanced development that has been in Program Element 6.36.28.A, Field Artillery Ammunition, and is dependent upon technology developed under Program Element 6.26.03.A, Large Caliber and Nuclear Technology. The US Marine Corps has stated an interest in the M198 and plans an FY 1979 procurement program. Cooperative agreements exist with NATO nations on the characteristics of 155mm howitzers to include the requirement for ammunition interchangeability. An M198 Development Prototype howitzer was lent to the Government of Australia under a Memorandum of Understanding submitted to the Government of Australia in early 1975.

H. WORK PERFORMED BY: US Army Armament Research and Development Command at Rock Island, IL; Dover, NJ; Aberdeen, MD; and Yuma Proving Ground, Yuma, AZ. Contractors on the M198 howitzer production are: Consolidated Diesel Electric Company, Old Greenwich, CT: and Numax Electronics, Inc., Hauppauge, Long Island, NY.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Engineering development was initiated for a new family of 155mm propelling charges (XM211 low zones, XM201 intermediate zones, M203 maximum zone) for the M198 and M109A1 howitzers. The M203 charge was type classified in FY 1977 with the M198 howitzer and is being tested for compatibility with the M109A1 howitzer. The XM201 charge development was suspended in FY 1978 due to excessive cannon tube wear. The XM708 high explosive (HE) projectile was terminated in FY 1976 and advanced development of the MX795 HE cargo optimized projectile was initiated. Metal parts were manufactured and initial development tests were conducted. A validation in-process review (VAL-IPR) was conducted in FY 1978 and the XM795 entered engineering development. The XM761 smoke projectile exhibited instability in flight and reentered advanced development in FY 1977. Funds programed for engineering development were reprogramed to accomplish advanced development. Alternate approaches to payload materiel, either red or white phosphorous, were evaluated as well as alternate payload design configura-

tions. Initial development and operational tests (DT/OT I) were conducted in FY 1978 on two competitive designs, the XM802 and XM825 projectiles. Concept formulation for the M198 howitzer was completed in FY 1973. The design of the DT/OT II prototype weapons was frozen in June 1974. All phases of DT/OT II testing of the M198 were initiated in FY 1975. An Army Systems Acquisition Review Council III (ASARC III) convened on 14 October 1976 and approved the XM198 for type classification standard and to enter production. Environmental testing was initiated in fourth quarter FY 1976 with one prototype shipped to Australia for tropic testing. Ammunition compatibility testing with the M198 howitzer was initiated on the M692 antipersonnel mine projectile and the M483A1 improved conventional munition projectile, and Development Test (DT) III testing of production M198 howitzers was initiated in FY 1978. First production howitzers were accepted by the Army in July 1978, and the initial phase of follow-on evaluation was initiated in Oct 78.

2. FY 1979 Program: Development of the XM211 Propelling Charge will continue and the charge configuration will be finalized. Development of the XM795 high explosive (HE) Projectile will continue and development/operational test (DT/OT) II will begin. The redesigned smoke projectile will enter Engineering Development (ED) with manufacture of components and initiation of testing. Compatibility testing of M692 (ADAM) Projectile and the M454 projectile will be completed as will DT III testing of production M198 howitzers. United Kingdom stick propelling charges will be procured and tested against performance and safety requirements in the M198 howitzer with the M549 high explosive rocket assisted projectile and the M483A1 improved conventional munition (ICM) projectile.

3. FY 1980 Planned Program: Conduct DT/OT II tests to include safety tests, cold weather tests, and ballistic match tests of the XM211 propelling charge and the XM795 HE projectile, convene a development acceptance in-process review and type classify both items. Continue development of the smoke projectile. Continue NATO ammunition compatiblity testing with trilateral charges and US projectiles in the M198 howitzer and the M109A1 howitzer. All necessary experimental work has been done and the system is ready for full-scale development.

4. FY 1981 Planned Program: Continue DT/OT II of the smoke projectile, complete development and type classify the projectile. Continue NATO ammunition and weapons compatibility testing.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D373 Title: Ammunition, Cannon, 155mm
Program Element: #6.46.14.A Title: Field Artillery Weapons and Ammunition, 155mm
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The purpose of this project is to conduct engineering development of ammunition components for 155mm howitzers. New propelling charges will replace standard charges to reduce from four to three the number of charges required to provide the full range capability of the 155mm system, which will ease the gunnery and logistic problems of artillery units. The new charges will be in agreement with ballistic parameters contained in a Memorandum of Understanding signed in 1978 between the United States and three European allied nations. A new high explosive projectile is being developed using high fragmenting steel to provide significantly increased lethality and range. It will be ballistically similar to the cargo optimized family (M48A1 ICM, M692/M718 mines), and be compatible with the M203 maximum propelling charge to provide the full unassisted range capability of the 155mm howitzer system, a 23% increase over the current standard high explosive projectile. A new smoke screening projectile is being developed to provide a significantly longer lasting source of screening smoke than current standard projectiles.

B. RELATED ACTIVITIES: The development of new munitions for 155mm howitzers is a continuation of advanced development efforts funded under Program Element 6.36.28.A, Field Artillery Ammunition Development. Direct liaison is maintained with the US Marine Corps to provide close coordination of development programs. Close coordination is maintained with developments in Program Element 6.36.29.A, Field Artillery Cannon Systems to ensure ammunition compatibility.

C. WORK PERFORMED BY: Project Manager for Cannon Artillery Weapon Systems, US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; ARRADCOM, Edgewood, MD; and Army Materiel Systems Analysis Agency, Aberdeen, MD.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Engineering development was initiated for a new family of 155mm propelling charges (XM211 low zones, XM201 intermediate zones, M203 maximum zones) for the M198 and M109A1 howitzers. The M203 charge was type classified in FY 1977 with the M198 howitzer and is being tested for compatibility with the M109A1 howitzer. The XM201 charge development was suspended in FY 1978 due to excessive cannon tube wear. The XM708 high explosive (HE) projectile was terminated in FY 1976 and advanced development of the XM795 HE cargo optimized projectile was initiated. Metal parts were manufactured and initial development tests were conducted. A validation in-process review was conducted in FY 1978 and the XM795 entered engineering development. The XM761 smoke projectile exhibited instability in flight and reentered advanced development in FY 1977. Funds programed for engineering development were reprogramed to accomplish advanced development. Alternate approaches to payload materiel, either red or white phosphorous were evaluated as well as alternate payload design configurations. Initial development and operational tests (DT/OT I) were conducted in FY 1978 on two competitive designs, the XM802 and XM825 projectiles.

Project: #D373 Title: Ammunition, Cannon, 155mm
Program Element: #6.46.14.A Title: Field Artillery Weapons and Ammunition, 155mm
DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

2. FY 1979 Program: Continue engineering development of the XM211 propelling charge and finalize the charge configuration. Manufacture sufficient charges to conduct development test/operational test (DT/OT II) testing. Release contract authority for the manufacture of XM795 metal parts assemblies and load rounds (2438) for DT/OT II. Conduct engineering development testing (including transonic precision at Nicolet, Canada) and begin DT/OT II tests. Complete fracture mechanic studies and initiate producibility engineering planning. Conduct metallographic verification of nondestructive testing techniques. A validation-in-process review will be held to select the smoke projectile configuration to enter engineering development. Components will be fabricated and rough handling tests conducted. Ballistic similitude tests will be conducted at Yuma Proving Ground while desert, air transportability, tropic, and storage tests will be conducted at Dugway Proving Ground.

3. FY 1980 Planned Program: Conduct DT/OT II tests to include safety tests, cold weather tests, and ballistic match tests of the XM211 propelling charge and the XM795 high explosive (HE) projectile, convene a Development Acceptance IPR and type classify both items. Continue development of the smoke projectile. Fabricate projectiles and smoke sub-components for DT/OT II and initiate DT/OT II at Dugway Proving Ground.

4. FY 1981 Planned Program: Continue DT/OT II of the smoke projectile, complete development, and type classify the projectile.

5. Program to Completion: This is a continuing program.

6. Major Milestones: Not applicable.

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	1503	8170	5233	2110	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	1996	8170	8412	Not Applicable	Continuing	Not Applicable
Quantities (current requirements)	Not feasible to list due to number of diverse items					
Quantities (as shown in FY 1979 submission)	Not feasible to list due to number of diverse items					
Ammunition Procurement, Army:						
Funds (current requirements)	0	7500	9900	34700	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	20300	73200	0	488900	588500

Project: #D373 Title: Ammunition, Cannon, 155mm

Program Element: #6.46.14.A Title: Field Artillery Weapons and Ammunition, 155mm

DoD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

Quantities (current requirements)						
M203	0	50(K)	59(K)	137(K)	Continuing	Not Applicable
XM211	0	0	0	246(K)	Continuing	Not Applicable
Quantities (as shown in FY 1979 submission)	0	0	0	0	Continuing	Not Applicable
XM201	0	0	360		2100	2460
XM211	0	0	85		1950	2036
M203	0	117	117		348	628

FY 1980 RDTE funds are reduced as the XM201 propelling charge was found to produce excessive tube wear and erosion and the development was suspended. The costs to complete XM795 development program was reduced. Procurement quantities and funds were charged to reflect Army priorities.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	31564	28875	32979	14437	2657	206978
	QUANTITIES						
	Infantry Fighting Vehicle (IFV)						20
	Firing Port Weapon (FPW)						90
D258	IFV - XM2	31564	28875	32979	14437	2657	204638
D460	FPW	0	0	0	0	0	2340

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Mechanized infantry requires a vehicle that provides the capability to operate effectively as an integral part of the combined arms force on the modern battlefield. The vehicle must permit the squad to fight mounted or dismounted as required. Suppressive automatic weapon fire to ATGM ranges and antitank capability are required. Functional requirements include long- and short-range suppression, fire stabilized on the move, capability to fire from a protected position, night and limited visibility capability, firepower to kill tanks and lightly armored vehicles, and mobility compatible with the XM1 tank. This program will develop the Infantry Fighting Vehicle (IFV) XM2. The IFV is an armored, full tracked, fighting vehicle for mechanized infantry. It provides increased mobility and protection, and a mounted fighting capability to the infantry. The vehicle can swim (with barrier), and is air transportable in C141 and C5A aircraft. The vehicle's design uses the Vehicle Rapid Fire Weapon Systems - Successor (BUSHMASTER) as its primary armament and incorporates the Tube Launched Optically Tracked Wire Guided (TOW) missile system in an under armor configuration. Within this program the Firing Port Weapon (FPW) for the IFV and training devices are also developed. The IFV will be the US Army's first infantry fighting vehicle.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds requested are to support completion of Producibility, Engineering and Planning (PEP) effort, Prototype Qualification Test-Government (POT-G), and Operational Test II (OT II). Work will be initiated for development of trainers and simulators, nuclear hardening compatible with XM1, and integration of ventilated facepiece chemical protective mask for designated crew members.

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Cancelled Mechanized Infantry Combat Vehicle (MICV) 20mm Program	Mar 77	Mar 77
Award Producibility, Engineering, and Planning (PEP) Contract	Jun 78	May 78
Receive First IFV Engineering Development (ED) Vehicles	Nov 78	Aug 78
Begin Prototype Qualification Test - Government (PQT-G) on FPW	Aug 78	Aug 78
Begin Prototype Qualification Test - Contractor (PQT-C) on IFV	Dec 78	Sep 78
Begin Prototype Qualification Test - Government (PQT-G) on IFV	Jun 79	Apr 79
Begin Operational Test II (OT II) on Infantry Fighting Vehicle (IFV)	May 79	May 79
Complete OT II on IFV	Nov 79	Oct 79
Complete Prototype Qualification Test - Government (PQT-G) on IFV	Apr 80	Dec 79
Army Systems Acquisition Review Council III (ASARC III)	Dec 79	Jul 80
Initial Operational Capability (IOC)		

As a result of late release of design drawings, vendor delay in delivery of castings and forgings, and a shortage of selected shop skills for final assembly a three-month delay in delivery of the first IFV prototype has occurred. PQT-C and PQT-G dates have been adjusted to maintain the Congressionally-directed production date of May 1981. Length of PQT-G has increased one month to incorporate more durability testing. FY 1979 schedule was based on long-lead item procurement funding becoming available in FY 1980. Since that submission, Congress has provided funds for long-lead item procurement in FY 1979; consequently, ASARC is earlier.

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	31564	28875	20555	5319	182780

A schedule slip in manufacture of prototype vehicles requires additional funding. As a result of the prototype delay, an additional $2,300,000 in FY 1980 is requested for schedule compression to meet the Congressionally-directed production date of May 1981. Insufficient funds were previously projected for development of trainers and simulators. An analysis of requirements completed in July 1978 by Training and Doctrine Command (TRADOC) has resulted in an increase in scope of work. The current estimate for this effort is an additional $6,000,000 in FY 1980 and $5,500,000 in FY 1981. As a result of the Congressionally-directed study of chemical protection for armored vehicles, a ventilated facepiece protective system has been added to the vehicle requirements. Required additional funding is $1,023,000 in FY 1980 and $1,275,000 in FY 1981. To make the vehicle compatible with the XM1 in terms of nuclear hardening requires additional funding of $3,100,000 in FY 1980 and $5,000,000 in FY 1981, determination of exact scope of work will be established during FY 1979 engineering analysis.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicle Procurement, Army:						
Funds (current requirements)	0	39000	100300	216900	2539700	2896300
Funds (as shown in FY 1979 submission)	0	0	0	0	0	0
Quantities (current requirements)	0	0	119	363	4383	4865
Quantities (as shown in FY 1979 submission)	0	0	0	0	0	0

Procurement funding was deleted during OSD/OMB review in FY 1979. Congressional action provided funds as shown for procurement of long lead items.

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: US Army doctrine for the post-1970 period requires the capability to engage in mounted combat be provided to the mechanized infantry commander. To permit this, it is necessary that the infantry combat vehicle provide protection against enemy automatic weapons and also allow the infantry to fight from within the vehicle. The Infantry Fighting Vehicle must be compatible in mobility with the tanks of the period. The IFV will be the Army's first Infantry Fighting Vehicle and will provide improved combat effectiveness for selected mechanized infantry units.

G. RELATED ACTIVITIES: Program Element (PE) 6.46.17.A, Vehicle Rapid Fire Weapon System supports the Infantry Fighting Vehicle (IFV) program by providing for a 25mm automatic cannon for use as the primary weapon on the vehicle. The Cavalry Fighting Vehicle (CFV), PE 6.46.29.A provides funds to support the development effort required to produce the adaptations necessary for conversion to the CFV configuration. Funds are provided to IFV from Project Manager (PM) General Support Rocket System (GSRS) Program Element 6.33.03.A for development of Fighting Vehicle System GSRS Derivative vehicle. The Firing Port Weapon (FPW) project was formerly funded in PE 6.36.07.A, Army Small Arms Program.

H. WORK PERFORMED BY: The IFV engineering development is being conducted by the FMC Corporation, San Jose, CA. Major subcontractors involved in this program are General Electric, Pittsfield, MA; Cummins Engine Co, Columbus, IN, and Hughes Aircraft Co, Culver City, CA. Support, as required, is being performed by the US Army Tank Automotive Research and Development Command, Warren, MI; US Army Armament Research and Development Command, Dover, NJ; US Army Electronic Research and Development Command, Fort Monmouth, NJ; US Army Missile Research and Development Command, Huntsville, AL; and the Project Manager, Tube Launched Optically Tracked Wire Guided Missile (TOW), Huntsville, AL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Mechanized Infantry Combat Vehicle (MICV) program was approved by the Defense Systems Acquisition Review Council (DSARC) in April 1972. Following the source selection process, a cost-plus incentive-fee contract was awarded to FMC in November 1972 for Engineering Development and Advanced Production Engineering. The Firing Port Weapon (FPW) project was transferred to this program following the Concept Formulation In-Process Review in May 1974. The Modified M16 Rifle was selected to enter engineering development (ED) as the candidate weapon. As a result of inadequate transmission reliability, a backup transmission program was initiated with Allison in September 1975 and a contract was awarded to General Electric for a Reliability Improvement Selected Equipment program to improve transmission reliability. Prototype Qualification Test-Government (PQT-G) was initiated on 1 October 1975. When testing revealed uncertainties relative to the transmission, tests were terminated. As a result, the dual transmission program was initiated with Allison. During the remainder of FY 1976, transmission problems were corrected and verified, and Allison transmissions were installed in four vehicles. General Electric transmissions were updated and installed in four vehicles for Prototype Qualification (PQT-G) and Operational Test (OT) II tests, which resumed October 1976. During the final quarter of FY 1976, the Army organized a Special MICV Task Force to review the total MICV program and make recommendations on vehicle configuration in view of the operational requirement.

The task force recommended a redirection of the program from a one-man to a two-man turret with the inclusion of the Tube Launched Optically Tracked Wire Guided (TOW) missile for an on-board antitank capability. On 3 November 1976, the Secretary of the Army approved the recommendations of the Task Force and the development of a new Fighting Vehicle was begun with the award of the sole-source development by letter contract to FMC Corporation. In January 1977, a Defense Department program budget decision eliminated the one-man turret, 20mm Mechanized Infantry Combat Vehicle (MICV) from FY 1978 production and authorized only 27 vehicles in FY 1979. Since these 27 unique vehicles were determined not to be cost effective, the Army terminated the 20mm MICV program in March 1977, and approved the application of its resources for use in the development of the new Infantry and Cavalry Fighting Vehicles. At that time ongoing Prototype Qualification Test-Government (PQT-G) and Producibility Engineering and Planning (PEP) efforts related to the 20mm MICV were terminated. In June 1977 General Electric was selected as the sole transmission contractor for the Infantry Fighting Vehicle (IFV). On 30 July 1977, the MICV Systems Office was officially redesignated as the Fighting Vehicle Systems (FVS) Office with the MICV renamed the Infantry Fighting Vehicle (IFV), XM2, and the MICV/Scout the Cavalry Fighting Vehicle (CFV), XM3. The PEP contract was awarded in June 1978. Integrated sight development and missile guidance set repackaging effort were initiated. Initial TOW firings were successfully conducted in July 1978. A Congressionally-directed study, Crizer Task Force, confirmed the requirement for and current design of the IFV/CFV. Further, it recommended against developing a more survivable vehicle at this time. As directed by the Office of the Secretary of Defense, a study of less costly derivatives and force structure changes was conducted. Results of the Mahaffey study were that the current IFV/CFV program is the best in terms of cost and operational effectiveness among all derivative type vehicles considered.

2. FY 1979 Program: Integrated sight development and missile guidance set repackaging effort will be completed. Producibility Engineering and Planning (PEP) phase will be continued. First Engineering Development vehicles were received in November 1978. Prototype Qualification Test-Contractor (PQT-C) began in December 1978. This effort will consist of a 6000 mile operational test on each of two vehicles to determine the capability of the system to meet established goals. Prototype Qualification Test-Government (PQT-G) will be started in April 1979. This effort will be conducted on two IFV's with the selected 25mm weapon for a distance of 6000 miles each. PQT-G will also include ballistic testing on fabricated armor plates. IFV Operational Test II (OT II) starting in May 1979 will be conducted using typical mechanized infantry and support soldiers.

3. FY 1980 Planned Program: During FY 1980, PEP, OT II, and PQT-G will be completed. Development of trainers and simulators, nuclear hardening compatible with XM1, and integration of a ventilated facepiece will be initiated. Both the Army Systems Acquisition Review Council (ASARC) III and Defense Systems Acquisition Review Council (DSARC) III will meet. Award of a sole-source production contract to FMC is scheduled for February 1980. Upon completion of all other testing, one vehicle will undergo ballistic evaluation.

4. FY 1981 Planned Program: Development of trainers and nuclear hardening will continue. Integration of ventilated facepiece will be completed.

5. Program to Completion: RDTE effort remaining beyond FY 1980 will include completion of trainers, nuclear hardening, and testing as required.

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Development contractor - FMC Corporation, San Jose, CA.

b. The Mechanized Infantry Combat Vehicle (MICV) entered engineering development without undergoing Development Test I (DT I) because the extensive effort since 1964 on the MICV program assured program worth and readiness to warrant commitment of resources to full scale development in accordance with established policy. This concept validation effort included hardware development and testing such as: (1) test of six XM701 (MICV-65) prototype vehicles; (2) testing of four different weapon station stabilization systems; (3) hull mockups and firing tests against different thicknesses and materials of armor plate; (4) testing of various engine and transmission candidates; (5) development and prototype testing of a suspension prototype designed to provide the hypermobility characteristics required; and (6) testing of various other subsystems such as night vision periscopes, auxiliary water propulsion devices, gun systems both in the stabilized weapon platform and through vehicle firing ports. The results of these evaluations allowed establishment of firm requirements regarding wheels vs track; size of crew, weapon, and vehicle; stabilization; weight, and other characteristics.

c. Prototype Qualification Test-Government (PQT-G) (Development Test II) for the MICV officially started 1 October 1975 at Aberdeen Proving Ground (APG), MD, and Yuma Proving Ground (YPG), AZ. However, due to the lack of improved performance by the transmission, testing was stopped at the end of January 1976. Contingency plans for corrective action were initiated on 2 February 1976. PQT-G was restarted on 4 October 1976 and continued through March 1977 when the MICV/20mm program was terminated. There has been a net increase in vehicle weight of approximately 3000 pounds which is primarily attributable to the design change from the one-man fighting station to the two-man TOW BUSHMASTER Armored Turret (TBAT-II). During development testing, areas of concern were identified which resulted in vehicle redesign or consideration for changes in requirements. Specific instances were: (1) introduction of a water barrier for swimming due to marginal vehicle freeboard during water operation; (2) repackaging of the power pack and cooling system as an integrated unit for ground hop capability; and (3) consideration of a two-man weapon station resulting from operational tests which identified limited commander command and control capability in his hull location as well as highly complex gunner operations in mission performance. Testing was accomplished by US Army Test and Evaluation Command (TECOM) using civilian technicians and test center military personnel. PQT-G for the new generation Infantry Fighting Vehicle/Cavalry Fighting Vehicle (IFV/CFV) will be started in June 1979 and conclude in April 1980.

d. An Initial Production Test (IPT) will be initiated in October 1981, to be concluded in July 1982. These tests will be conducted by TECOM at APG, YPG, and Fort Greely, AK, using civilian technicians and test center military personnel.

2. Operational Test and Evaluation:

a. The Mechanized Infantry Combat Vehicle (MICV) was in full engineering development without having undergone Operational Test I (OT I). See paragraph 1b above for the rationale behind this action.

b. An Operational Climatic Test/Force Development Test and Experimentation (OCT/FDTE) was conducted during January-March 1976. The test was conducted at Fort Knox, KY using US Army Forces Command (FORSCOM) troops as player participants. The Operational Climatic Test provided limited data on capabilities, limitations, and safety aspects of the Mechanized Infantry Combat Vehicle (MICV) system in European winter thaw conditions. The FDTE developed mobility/movement rate data on the MICV. Operational Test II (OT II) was conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Benning, GA using mechanized infantry troops as player participants. The test vehicles were armed with the M139 20mm automatic cannon as the interim main armament pending production of the Vehicle Rapid Fire Weapons System--Successor (VRFWS-S). The test started 4 October 1976 and ran until 31 January 1977 at which time a need for additional user training and 20mm gun modifications became apparent due to complexity of one-man fighting station. As a result of termination of the MICV/20mm program in March 1977, the scheduled restart of this test was cancelled.

c. OT II for the Infantry Fighting Vehicle (IFV) will be conducted using typical mechanized infantry and support soldiers. The training phase is scheduled to start in May 1979 and the field/tactical phase is scheduled to start in September 1979 and will run for a period of three months. OT II for the IFV will be conducted by OTEA at Fort Carson, CO.

d. A Follow-On Evaluation (FOE) is tentatively scheduled for initiation in 2d Qtr FY82.

Program Element: #6.46.16.A
DoD Mission Area: #412 - Close Combat

Title: Infantry Fighting Vehicle (IFV) XM2
Budget Activity: #4 - Tactical Programs

3. Systems Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance 1/
Maximum Speed (mph)	40-45	
Cruising Range (miles)	300	
Acceleration 0-30 mph (sec)	18-22	
Stabilization Accuracy on a 4 mil target (% time on target)		
Single Shot Accuracy to 1000 meters (round to round standard deviation)		
Armor Protection		
Frontal		
Side, Rear		

1/ To be determined at Prototype Qualification Test - Government/Operational Test II.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapon System (VRFWS) - (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	12164	7180	4108	0	0	84248 1/
	QUANTITIES						
	25mm Guns						46
	25mm Ammo						523270
D340	VRFWS - BUSHMASTER	12164	7180	4108	0	0	84248 1/

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A 25mm automatic cannon is being developed as the primary weapon for application to the Infantry Fighting Vehicle, IFV (formerly the Mechanized Infantry Combat Vehicle, MICV), and the Cavalry Fighting Vehicle, CFV (formerly the Armored Cavalry Vehicle, ACV). Additionally, 25mm ammunition is being developed for this weapon. The Technical Data Package (TDP) for the M139 Product Improved 20mm Cannon was completed, but use of the M139 as the interim primary weapon on MICV was terminated by the Army in March 1977.

C. BASIS FOR FY 1980 RDTE REQUEST: The Producibility Engineering and Planning (PEP) contract will be completed. Vehicle Prototype Qualification Test-Government (PQT-G) and Operational Test (OT) II using the selected weapon will be supported. The initial production contract will be awarded to the winning competitor.

1/ Excludes prior expenditure of $3,100,000 in Program Element 6.36.11.A, Advanced Automatic Cannon, Project D082.

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapon System (VRFWS) - (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
M139 Product Improved 20mm		
Started Engineering Development (ED)	Apr 74	Apr 74
Completed ED	Jun 76	Jun 76
Completed Check Test	Feb 77	Feb 77
Completed Producibility Engineering and Planning (PEP)	Sep 77	Sep 77
BUSHMASTER Self-Powered; 25mm Guns & Ammunition		
Award of Product Engineering & Improvement (PE&I) Contract	Jul 75	Jul 75
Completed Product Engineering & Improvement (PE&I) Contract	Nov 77	Nov 77
Completed Prototype Qualifications Test - Government (PQT-G)	Nov 78	Oct 78
Perform Gun Evaluation - Government	Dec 78	Dec 78
BUSHMASTER Externally Powered; 25mm Gun		
Completed Engineering Development (ED)	Feb 78	Feb 78
Completed Prototype Qualifications Test - Government (PQT-G)	Nov 78	Oct 78
Perform Gun Evaluation - Government	Dec 78	Dec 78
25mm BUSHMASTER - Selected Gun		
Award Producibility Engineering Program (PEP) Contract	Jan 79	Feb 79
Complete PEP	Jan 80	Sep 80
XM714E5, 25mm Fuze		
Completed Engineering Development (ED)	Jul 76	Jul 76
Completed Machine Line	May 77	May 77
Complete PQT-G	Nov 78	Oct 78

FY 1979 submission estimated PQT-G would end in late October 1978. It was completed 2 November 1978. The PEP shown in FY 1979 supported first production funding in FY 1981. Due to Congressional action which provided long lead item funding for IFV in FY 1979, first production funding for BUSHMASTER is now FY 1980.

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapon System (VRFWS) - (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	12165	7180	4072	0	83397 1/

Revised estimates require an additional $36 for Producibility Engineering and Planning (PEP) in FY 1980.
1/ This contains an error in funds obligated prior to FY 1977, correct total is 84112.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicle Procurement, Army:						
Funds (current requirements)	0	0	37000	19400	354300	410700
Funds (as shown in FY 1979 submission)	0	0	0	0	0	0
Quantities (current requirements)	0	0	310	480	8467	9257
Quantities (as shown in FY 1979 submission)	0	0	0	0	0	0

Procurement funding was deleted during OSD/OMB review in FY 1979. Congressional action provided $39,000,000 in the Infantry Fighting Vehicle in FY 1979 for long lead items.

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapon System (VRFWS) - (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Fighting Vehicle Armament System program is for the development of a cannon to be used as primary armament on the Infantry Fighting Vehicle (IFV) (XM2) (formerly Mechanized Infantry Combat Vehicle (MICV), XM723) and the Cavalry Fighting Vehicle (CFV) (XM3). This automatic cannon is intended to provide a substantial improvement over the caliber .50 machine gun and the existing 20mm M139 cannon, currently being used as armament on US lightly armored vehicles. The automatic cannon is being developed with a capability to defeat reconnaissance and mechanized infantry combat vehicles, personnel, and unarmored targets. It will be a 25mm automatic weapon with dual feed capability that allows instantaneous selection of either armor-piercing discarding sabot tracer (APDS-T) or high-explosive incendiary tracer (HEI-T) ammunition. The ammunition being developed has been designated as the Tri-Service 25mm ammunition and will be proposed as NATO standard.

G. RELATED ACTIVITIES: The selected weapon and ammunition will be first used on the system being developed under Program Element 6.46.16.A, Infantry Fighting Vehicle (IFV) (XM2) and 6.46.29.A, Cavalry Fighting Vehicle (CFV) (XM3). Development of the Externally Powered 25mm automatic cannon was initiated in FY 1976 under Program Element 6.36.11.A, Advanced Automatic Cannon Program D082. The Army has maintained contact with the other services and has conducted periodic Tri-Service reviews on this program, to insure a cross-fertilization of technical knowledge on developmental programs and to prevent duplication of effort.

H. WORK PERFORMED BY: The Project Manager, Fighting Vehicle Armament Systems, is responsible for development of the weapon and ammunition to include the execution of all project related activities. The prime contractor for the Self-Powered (SP) weapon and the 25mm ammunition is Ford Aerospace and Communications Corporation, Newport Beach, CA. The prime contractor for the Externally Powered (EP) weapon is Hughes Helicopter, Culver City, CA. The Product Improved (PI) M139 effort was accomplished in-house at Benet Lab of Watervliet Arsenal, Watervliet, NY. The XM714 fuze contractor is Honeywell, Minneapolis, MN.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The qualitative material requirement for the BUSHMASTER system was approved in 1966. A development program was finalized in FY 1970 and the Decision Coordinating Paper (DCP) 81A was approved in December 1971. Three contractors participated in a competitive validation phase shoot-off by the US Army Test and Evaluation Command at Aberdeen Proving Ground, Maryland, during 1973. Philco Ford was selected for FSD. However, the pending ASARC was postponed to address issues raised in the Middle East War. An Army Systems Acquisition Review Council (ASARC) II on 17 December 1974 recommended the M139 product improved (PI) weapon be used as an interim weapon on the Mechanized Infantry Combat

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapon System (VRFWS) - (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

Vehicle (MICV), and engineering development (ED) be initiated on the selected weapon. Following the Defense Systems Acquisition Review Council (DSARC) II held on 6 March 1975, the Deputy Secretary of Defense directed that the Swiss Oerlikon 25mm Automatic Gun (KBA-B02) be evaluated for potential procurement to meet Army requirements and indicated that the M139 PI should be continued only if it was more economical. Following the evaluation, the Army was directed to Americanize the KBA B02 for concurrent production. The Army also was directed to expedite the development of a 25mm externally powered (EP) weapon and conduct a comparative evaluation with the self-powered (SP) Americanized Swiss Oerlikon 25mm Automatic Gun (KBA-B02) weapon prior to selection of a weapon for Mechanized Infantry Combat Vehicle (MICV). A Production Engineering and Improvement contract was awarded to Ford Aerospace and Communications Corporation, the validation phase winner, on 11 July 1975. Simultaneously with the July 1975 award a stop work order was imposed pending the directed evaluation of the KBA B02; however, the ammunition effort was begun. SP gun work was authorized to begin on 20 February 1976. Also in February 1976 a fixed price contract was awarded Hughes Helicopter for the EP weapon. In March 1977, the Army cancelled the 20mm MICV Program thereby terminating the requirement for an interim 20mm M139 Product Improved (PI) Weapon. Prototype Qualification Test - Contractor (PQT-C) testing began in June 1977 and was completed in January 1978. Prototype Qualification Test - Government (PQT-G) for both candidate 25mm guns and the family of ammunition consisted of hardstand firing at Aberdeen Proving Ground (APG), Aberdeen, MD. PQT-G for the 25mm High Explosive Incendiary Tracer (HEIT) and Target Practice Tracer (TPT) ammunition was conducted as an integral part of the PQT-G hardstand weapon test during the period March 1978 to November 1978, and will lead to the Ammunition Type Classification. Side-by-side weapon testing began in March and continued through November 1978.

2. FY 1979 Program: After completing the 25mm Gun hardstand PQT-G firing test in November 1978, and using data from the Operational Test IA, one of the two candidate guns (EP/SP) will be selected in January 1979 as the primary weapon for the IFV/CFV. A 25mm Gun Producibility Engineering and Planning (PEP) contract will be awarded in January 1979 to the successful candidate; PEP effort will continue through FY 1979. PQT-G for the APDS-T round will be conducted from January 1979 to April 1979 leading to type classification in July 1979.

3. FY 1980 Planned Program: The PEP contract will be completed. Vehicle PQT-G and Operational Test (OT) II using the selected weapon will be supported. Production of guns and ammunition will be initiated to support production of the first vehicle by May 1981.

4. FY 1981 Planned Program: Not Applicable.

5. Program to Completion: No RDTE planned beyond FY 1980.

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapons System (VRFWS) - Successor (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: Three newly developed weapons and the standard M139 gun were subjected to an Advanced Verification Test (ADVT-G) Development Test I (DT I) at US Army Test and Evaluation Command, Aberdeen, MD, from 5 March 1973 to 29 June 1973. The purpose of the test was to provide data on the performance of the ammunition and weapons under evaluation in the BUSHMASTER program, so that a selection could be made from among the contenders for further development as the Vehicle Rapid Fire Weapon System--Successor. The weapons were subjected to 12 subtests, which included an initial examination; determinations of velocity, accuracy and dispersion, plate penetration and after-effects, belt-pull capacity, functioning, and high-low temperature tests; and tests with the weapon unlubricated and at various attitudes. Weapon maintenance and safety were also addressed. The ammunition was subjected to ten subtests. These included an initial examination; Mann-barrel accuracy, time of flight, self-destruct, velocity-pressure and action time, length of trace, fuze sensitivity, fuze-arming and safe-arming, and fragmentation tests; and a safety evaluation. Fifty-four criteria from the system specification were used to evaluate the performance of the systems. None of the systems tested met all the criteria. Separate, detailed reports have been published for each of the four contenders. The Ford Aerospace and Communications Corporation (Philco Ford) self-powered weapon was the selected candidate. The Defense System Acquisition Review Council II (DSARC II) was held on 6 March 1975. As a result of this review, the Army was directed to Americanize a self-powered 25mm weapon, using the Swiss Oerlikon 25mm KBA as a baseline, and to also proceed with the development of an externally powered 25mm weapon. A comparative evaluation of the self and externally powered weapons was conducted for selection of the primary weapon for the Infantry Fighting Vehicle/Cavalry Fighting Vehicle (IFV/CFV). Prototype Qualification Test-Government (PQT-G) began in March 1978 and concluded in November 1978. Testing included attitude firing, barrel endurance, belt pull, noise, toxic fumes, cook-off, dispersion, endurance, reliability, environmental, flash, smoke, human factors, and maintenance evaluation. The selection of a single weapon for the IFV/CFV will be made in January 1979.

2. Operational Test and Evaluation:

a. Operational Test I (OT I) was conducted by the US Army Operational Test and Evaluation Agency (OTEA) at the US Army Test and Evaluation Command, Aberdeen, MD, and San Jose, CA, from 20 February 1973 - 20 July 1973. OT was combined with Development Test (DT) in that the same three candidate prototype weapons evaluated in DT were evaluated in separate operational subtests against the baseline M139 20mm weapon. OTEA designed the operational subtests, collected the data and reported the results. Using soldiers with mechanized infantry and armored cavalry experience permitted OTEA to assess operator, weapon and firing station interface in a mock-up of a Mechanized Infantry Combat Vehicle (MICV). Additionally, operator handling and maintenance operations were evaluated.

b. As a result of DT I and OT I, the Defense System Acquisition Review Council II (DSARC II) recommended and the Deputy Secretary of Defense directed that the Army: (1) proceed with production engineering and improvement by Ford Aerospace and Communications Corporation of the KBA B02 baseline design as the self-powered candidate for the 25mm weapon system, (2) proceed immediately with full-scale development of a standard 25mm ammunition and (3) initiate immediately an aggressive program to develop annexternally-powered gun, to fire the standard 25mm ammunition, as a second candidate for the 25mm weapon system.

c. The US Army Operational Test and Evaluation Agency (OTEA) conducted an Operational Test-Ia (OT-Ia) on the 25mm weapon candidates during November - December 1978. The purpose of the test was to provide user considerations in the selection process of a 25mm weapon. The 4th Mechanized Infantry Division provided a mechanized infantry platoon for user troops.

d. OTEA will conduct an OT II on the selected 25mm system during the OT II of the IFV (Infantry Fighting Vehicle). Training is scheduled to start in May 1979 with testing to begin in September 1979.

Program Element: #6.46.17.A

Title: Vehicle Rapid Fire Weapons System (VRFWS) - Successor (BUSHMASTER)

DoD Mission Area: #412 - Close Combat

Budget Activity: #4 - Tactical Programs

1. System Characteristics:

Operational/Technical Characteristics	Objectives 2/	Demonstrated Performance
Reliability		
Mean Rounds to Stoppage	2,000	3/
Durability (rounds)		
Receiver	25,000	3/
Barrel	4,000	3/
Other Parts	4,000	3/
Maintainability (minutes)		
Field Strip	4	3/
Mean Time to Repair	15	3/
Caliber	25mm	25mm
Feed System	Dual	Dual
Rate of Fire	Variable to 550 shots per min	Meets requirement
Armor Piercing Ammunition		Exceeds requirement
High Explosive Ammunition		Exceeds requirement

2/ To be demonstrated in Production Validation Test (PVT-G).

3/ This information was determined furing Prototype Qualification Test-Government (PQT-G) and OT-Ia. At the time of preparation of this document, testing was not complete and a winning weapon had not been selected. Due to the sensitivity of the competition no results have been included. After announcement of the winning wepaon, this information will be provided separately.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.19.A
Title: Landmine Warfare
DoD Mission Area: #416 - Landmine Warfare
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	8001	14886	8850	9572	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D016	Mine Systems	3409	3515	800	4000	Continuing	Not Applicable
D088	Modular Pack Mine System (MOPMS)	0	7421	4100	5572	4000	23093
D301	Landmine Development (NATO)	0	300	0	0	0	300
D407	Antitank Artillery Mine XM718	0	1550	850	0	0	16597
D568	Ground Emplaced Mine Scattering System Antitank/Antipersonnel Mines	4592	2100	3100	0	0	29123

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for increased tactical effectiveness and responsiveness of landmines by supporting the development of a Family of Scatterable Mines (FASCAM) which can be dispensed rapidly from helicopter and ground dispensers, cannon artillery and rockets, tactical aircraft, and other means which prove cost effective. The minefield continues to be one of the most effective, efficient, and adaptable obstacles available. The increased pace of modern warfare together with the fluidity and porosity of today's battlefield make the use of labor intensive, hand emplaced, logistically burdensome, conventional landmines less effective than in previous wars. Current mines, which must be emplaced well in advance of the actual tactical need, lack the responsiveness and flexibility necessary for effective employment in rapidly changing tactical situations. Scatterable mines placed with multiple delivery means provide a formidable threat and deterent to mass armor attacks such as can be mounted by the Warsaw Pact. Scatterable mines will be used to delay, canalize, or interdict attacking enemy forces and to deny selected areas to the enemy.

C. BASIS FOR FY 1980 RDTE REQUEST: Complete Development Test III/Operational Test III (DT III/OT III) and initiate full-scale production of the artillery AT mine system. Type classify and initiate production of the Ground Emplaced Mine Scattering System (GEMSS). Conduct DT II/OT II on the Modular Pack Mine System (MOPMS). Initiate engineering development of a horizontal action off route mine.

Program Element: #6.46.19.A Title: Landmine Warfare
DoD Mission Area: #416 - Landmine Warfare Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	7781	14886	19799	Continuing	Not Applicable

In FY 1978, increase in funds reflects additional effort required on the GEMSS dispenser. In FY 1980, reduction reflects a delay of new mine systems entering engineering development as previously scheduled and movement of funds to higher priority Army Systems.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements) (Arty AT mines)	16000	51700	56400	54900	89600	268600
Funds (as shown in FY 1979 submission)	14000	51700	45400	-	114800	225900
Quantities (current requirements) (rounds)	4000	24000	30000	30000	48000	136000
Quantities (as shown in FY 1979 submission)	4000	24000	23000	-	62000	113000
Ammunition Procurement Army:						
Funds (current requirements) (GEMSS XM74/XM75 mines)	0	0	6700	9900	56100	72700
Funds (as shown in FY 1979 submission)	0	5800	10500	-	27300	43600

Program Element: #6.46.19.A
DoD Mission Area: #416 - Landmine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Quantities (current requirements) (mines)	0	0	12000	39000	279000	330000
Quantities (as shown in FY 1979 submission)	0	11000	44000	-	130000	185000
Other Procurement Army:						
Funds (current requirements) (GEMSS dispensers)	0	0	4900	20600	41200	66700
Funds (as shown in FY 1979 submission)	0	1800	12600	-	16300	30700
Quantities (current requirements) (each)	0	0	39	92	184	315
Quantities (as shonw in FY 1979 submission)	0	6	100	-	178	284

Changes in the procurement profiles on the artillery delivered antitank mine system reflect an increase in the ammunition rates based on studies of their use in intense combat. Cost revisions reflect adjustments based on current contracting experience. Changes in the GEMSS profiles reflect a slip in the type classification due to technical problems with the dispenser and an increase in mine rates and dispensers. No basic change in employment doctrine or assumptions have been made.

Program Element: #6.46.19.A
DoD Mission Area: #416 - Landmine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The minefield continues to be one of the most effective, efficient, and adaptable obstacles available. Conventional hand emplaced antitank (AT) and antipersonnel (AP) mines cannot keep pace with related battlefield activities. To overcome this deficiency, the Army for several years has pursued development of a Family of Scatterable Mines (FASCAM). FASCAM consists of smaller mines with improved lethality, target sensing and descrimination, and response times packaged for delivery by multiple means. The first generation scatterable mine, the M56 helicopter delivered AT mine, has been fielded in US Army, Europe. Production has commenced on the second generation M692 artillery delivered AP mine. The companion M718 artillery delivered AT mine was type classified standard for use and production commenced during FY 1978. The Ground Emplaced Mine Scattering System with both AT and AP mines is scheduled to complete development and enter production in FY 1980. The Modular Pack Mine System and the USAF GATOR air delivered system are well into development and will complete the second generation of mass scatterable mines. Scatterable mine systems utilize extensive component commonality during manufacture. The option to emplace minefields when and where desired in a matter of minutes provides the tactical commander with a unique capability which will impact on both friendly and enemy tactics.

G. RELATED ACTIVITIES: This program follows from advanced development (AD) Program Element (PE) 6.36.06.A, Landmine Warfare, where components and mine hardware concepts are devised. Principal system technical development responsibility is assigned to the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, under the management of the collocated Project Manager (PM) for Selected Ammunition, who maintains control of all phases of mine systems development, initial procurement, and logistical field support. Closely related to this PE is the joint-Service development of air delivered scatterable mines (GATOR). The scope of this development is controlled by an approved joint development plan. The Army is developing both AP and AT mines for the GATOR systems using FASCAM components under the Air Force as lead Service. Joint-Service mine requirements are coordinated through the Department of Defense (DoD) Armaments/Munitions Requirements and Development Committee and the Joint Technical Coordination Group for Bombs, Mines, and Clusters.

H. WORK PERFORMED BY: Principal Army Management Agency is the PM for Selected Ammunition, ARRADCOM, Dover, NJ. In-house support is provided by the US Army Mobility Equipment Research and Development Command, Fort Belvoir, VA; US Army Test and Evaluation Command and the Army Materiel Systems Analysis Agency, Aberdeen, MD; and Yuma Proving Ground, Yuma, AZ. Principal contractors are: Aerojet Ordnance and Manufacturing Company, Downey, CA; Hughes Aircraft Company, Fullerton, CA; Honeywell Incorporated, Hopkins, MN; Solid State Division, Sommerville, NJ; AAI Corporation, Cockeysville, MD; Chamberlain, Waterloo, IA; Bulova, Valley Stream, Long Island, NY; and FMC, San Jose, CA.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Scatterable mine development was initiated in the late 1960's with emphasis on the XM56 helicopter delivered antitank mine system and the XM692E1 artillery delivered antipersonnel mine system. During FY 1973, the XM56 and the XM692E1 systems entered developmental testing (DT) and the XM718 artillery delivered AT mine system entered

engineering development (ED). In FY 1974, the M56 helicopter antitank (AT) mine system was type classified standard. During FY 1975, the M56 AT mine system went into production; Development Test II/Operational Test II (DT II/OT II) continued on the XM692E1 antipersonnel (AP) mine system; and engineering design tests (EDT) continued on the XM718 AT mine system. Design and testing of the Groun Emplaced Mine Scattering System (GEMSS) and its associated XM75 AT mines and XM74 AP mines continued with emphasis on system reliability, maintainability, and human factors. The XM58 helicopter dispensed minefield marking system effort was redirected towards a rapid Hand Emplaced Minefield Marking System (HEMMS). Efforts continued on the joint-Service GATOR air delivered mines in coordination with Navy and Air Force. During FY 1976, the M692 artillery delivered AP mine was type classified standard and went into initial production, DT II/OT II was initiated on the XM718 artillery delivered AT mine; DT II/OT II test hardware for the GEMSS was procured; and DT II/OT II on HEMMS continued. In FY 1977, the M56 helicopter AT mine was fielded; initial production continued on the M692 artillery AP mine, DT II/OT II was completed on the XM718 artillery AT mine and initiated on the GEMSS; advance development on the Modular Pack Mine System (MOPMS) was completed; and the HEMSS was type classified standard for Army use. In FY 1978, DT II/OT II continued on the GEMSS; the M718 artillery AT mine was type classified standard and production initiated; OT III was conducted on the M692 artillery AP mine; MOPMS entered engineering development; and production on the HEMSS was initiated.

2. FY 1979 Program: Initiate full-scale production on the M692 artillery AP mine and field the system. Conduct DT II on the M718 artillery AP mine. Complete DT II/OT II on the GEMSS. Continue engineer design testing of the MOPMS.

3. FY 1980 Planned Program: Initiate full-scale production on the M718 artillery AT mine and field the system. Type classify the GEMSS and initiate production. Initiate DT II/OT II on the MOPMS. Initiate engineering development on a horizontal action off-route mine. All necessary experimental work will be performed and proposed system will be ready for full-scale development.

4. FY 1981 Planned Program: Field the GEMSS. Complete DT II/OT II on MOPMS. Continue ED on the off-route mine. Initiate ED on an improved conventional mine. All necessary experimental work will be performed and proposed system will be ready for full-scale development.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D088 Title: Modular Pack Mine System
Program Element: #6.46.19.A Title: Land Mine Warfare
DoD Mission Area: #416 - Land Mine Warfare Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The Army has spent the last few years developing a Family of Scatterable Mines (FASCAM) to replace the current labor intensive, logistically burdensome conventional mines. These small, highly lethal, scatterable mines can be responsively delivered by artillery, ground vehicle, helicopter, and tactical aircraft. This new capability to deliver mines rapidly once the enemy's intentions are known acts as a highly effective combat multiplier and will assist US Forces to fight outnumbered and win. The Modular Pack Mine System (MOPMS) plays a key role in completing FASCAM and can be used independently or in conjunction with other FASCAM systems, natural or man-made obstacles, and conventional mines. MOPMS is being developed to provide a rapid means of emplacing tactical, point or protective minefields, and to close lanes and gaps in existing minefields. MOPMS consists of a two-man portable pack which serves as the shipping, storage, and dispensing container. A remote command dispense capability will be provided to permit key areas to remain free of mines until tactically appropriate. The pack can be recovered if the mines are not dispensed for use elsewhere as needed. MOPMS utilizes the baseline FASCAM components, thereby accelerating the development at a significantly reduced risk.

B. RELATED ACTIVITIES: This project follows from advanced development Program Element 6.36.06.A, Land Mine Warfare, where components and the concept were devised. Principal system technical development responsibility is assigned to the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, under the management of the co-located Project Manager for Selected Ammunition. MOPMS is being developed under the family concept and utilizes a high degree of component commonality with other FASCAM systems.

C. WORK PERFORMED BY: Principal Army Management Agency is the Project Manager for Selected Ammunition, ARRADCOM, Dover, NJ. In-house support is provided by the US Army Test and Evaluation Command and the Army Materiel Systems Analysis Agency, Aberdeen, MD. Principal contractors are: Aerojet Ordnance and Manufacturing Company, Downey, CA; Hughes Aircraft Company, Fullerton, CA; and Honeywell Incorporated, Hopkins, MN.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Conducted Validation In-Process Review after system concept was demonstrated. Initial prototype hardware was procured and engineer design test conducted. Command dispenser signal transmitter was built and tested.

2. FY 1979 Program: Finalize design and conduct final engineer design tests. Procure long lead-time hardware components for Developmental Testing II/Operational Testing II (DT II/OT II).

Project: #D088 Title: Modular Pack Mine System
Program Element: #6.46.19.A Title: Land Mine Warfare
DoD Mission Area: #416 - Land Mine Warfare Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: Procure Developmental Testing II/Operational Testing II (DT II/OT II) hardware and initiate DT II/OT II testing to include arctic and tropical tests. Initiate development of skill performance aids and technical manuals to support Army Training Programs.

4. FY 1981 Planned Program: Complete DT II/OT II and type classify standard for Army use. Complete skill performance aids.

5. Program to Completion: Initiate procurement in FY 1982.

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Validation In-Process Review	1QFY78	1QFY78
Developmental Testing II	4QFY80-3QFY81	4QFY80-3QFY81
Operational Testing II	2QFY81-3QFY81	2QFY81-3QFY81
Developmental Acceptance In-Process Review and Type Classify Standard	4QFY81	4QFY81
Initial Procurement	FY82	FY82

Milestones remain unchanged.

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	7421	4100	5572	4000	23093
Funds (as shown in FY 1979 submission)	0	7421	7120	--	3572	18113
Quantities (current requirements)		To be determined				
Quantities (as shown in FY 1979 submission)		none shown				

Project: #D088 — Title: Modular Pack Mine System
Program Element: #6.46.19.A — Title: Land Mine Warfare
DoD Mission Area: #416 - Land Mine Warfare — Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Appropriations						
Ammunition Procurement, Army						
Funds	0	0	0	-	To be determined	To be determined
Quantities	0	0	0	-	To be determined	To be determined

Changes in the FDTE profiles reflect the following: In FY 1980, reduction reflects improved cost estimates and finalization of test schedule. In FY 1981, increased costs are related to prototype design changes, increased training and requirements, and funds not expended in previous years due to minor program adjustments. Additional funds identified are for improved technical manuals and costs associated with initial fielding.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.20.A
Title: Tank Systems
DoD Mission Area: #412 - Close Combat
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	119643	78376	31569	2511	200	583508
	QUANTITIES						13
DG20	Tank, XM1	119643	78376	31569	2511	200	583508

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The XM1 is a four man, highly mobile, fully tracked vehicle with significantly improved survivability provided by improved ballistic protection and compartmentalization. The XM1 will mount a large caliber main gun and two or more complementary armament systems with improved day/night fire control and shoot-on-the-move capabilities. Higher cross-country speeds and faster acceleration provided by a 1500 horsepower turbine engine will make the XM1 tank a more difficult target for opposing ground and air forces. The XM1 is required to counter potential enemy armor threats of the 1980's and 1990's. It will replace the M60 series of tanks and become the primary offensive weapon of the Army's combined arms team.

C. BASIS FOR FY 1980 RDTE REQUEST: Chrysler Corporation will conclude its work on the Full Scale Engineering Development/ Producibility Engineering and Planning program for the XM1. Development and refinement of the armor configuration, compartmentalization techniques, engine durability testing, and development of training devices and kits will be completed during the period.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Complete Development Test/Operational Test (DT/OT) II	July 1979	July 1979
Defense Systems Acquisition Review Council (DSARC) III	April 1979	February/March 1979
Award Low Rate Initial Production (LRIP) Contract	May 1979	May 1979
Delivery of First LRIP Tank	February 1980	February 1980

Program Element: #6.46.20.A
DoD Mission Area: #412 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

Conduct DT III/OT III	March/December 1980	March/December 1980
Initial Operational Capability (Tank Company)		
Decision to Start Full Production (DSARC IIIA)	February 1981	February 1981
European Operational Capability (Tank Battalion)		

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	117645	78376	31578	2513	581442

The FY 1978 increase was used to support RDTE work in AGT-1500 turbine engine design. The increase of $200,000 in FY 1982 and beyond is to support engineering efforts which may be required during the issuing of the XM1 tank to field units (Project Handoff).

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles Procurement:						
Funds (current requirements)	159500	385300	679700	1060100	7739000	10044800
Funds (as shown in FY 1979 submission)	157000	418600	782200	--	8319500	9698500
Quantities (current requirements)	0	110	352	591	6005	7058
Quantities (as shown in FY 1979 submission)	0	110	569	--	6379	7058

Differences in the FY 1978 procurement funding reflect an increase in contractor auxiliary service support. Differences in the FY 1979 procurement funding reflect a Congressional decrease of $34,600,000 in Initial Production Facilities (IPF) funds of $1,300,000 in spare parts funds. Differences in FY 1980 represent a Secretary of Defense decision to reduce the previously planned FY 1980 procurement funding by $100,000,000 due to OSD's expectation of a program slippage.

Program Element: #6.46.20.A
DoD Mission Area: #412 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Congress terminated the XM803 Main Battle Tank program in FY 1972 as unnecessarily complex, excessively sophisticated and too expensive, and directed initiation of a new tank prototype program. The objective of this program is to counter the quantitatively superior Soviet tank forces by reproducing a qualitatively superior tank for use as the primary weapons systems in a highly mobile, sustainable, combined arms force. The XM1 will be superior in the areas of survivability, firepower, and mobility and hence will provide a dramatic increase in combat capability. The ballistic protection offered by special armor coupled with its inherent agility makes the XM1 significantly more survivable than the M60 tanks. The XM1 silhouette is reduced and compartmentalization stressed to reduce vulnerability to antitank fire. Improved fire power will be provided initially by a 105 millimeter (mm) gun and subsequently (FY 1984) a 120mm gun. The 1500 horsepower turbine power package coupled with the high performance suspension system provides superior cross-country mobility. The program was approved on 18 January 1973 and contracts awarded to General Motors and Chrysler on 28 June 1973 for the competitive Validation Phase of the XM1 program. Competitive evaluation of the two prototypes was completed on schedule (July 1976); however, the Defense Systems Acquisition Review Council (DSARC) decision on the selection of a single Full Scale Engineering Development (FSED) contractor was delayed 120 days until a resolicitation, considering a standardized version of the XM1, could be developed. Testing of the Leopard 2 (American Version (AV)) tank in accordance with the December 1974 United States/German Memorandum of Understanding (MOU) on harmonization of Main battle tanks was initiated on 10 September 1976 and completed in mid December 1976. The DSARC met on 10 and 11 November 1976 and selected Chrysler Corporation for the fabrication and delivery of eleven pilot vehicles to be used during Development Test/Operational Test (DT/OT) II. The FSED contract was awarded on 12 November 1976. In January 1977, an Addition to the Addendum to the MOU was signed which limited technical evaluation of the Leopard 2 (AV) to consideration of selective subsystems/components for standardization/interoperability. The eleven Chrysler XM1 pilot vehicles were delivered to the Army starting in February 1978.

G. RELATED ACTIVITIES: There is no other program being conducted by other Services that meets the XM1 requirements. The Marine Corps is closely monitoring the XM1 development in relation to their requirement for a battle tank in a high intensity environment for subsequent operations ashore. Related and nonduplicatory Army activities being conducted are as follows: Program Element (PE) 6.46.30.A, Tank Gun Cooperative Development; PE 6.46.02-DG21, Tank Ammunition; and PE 6.46.15-DE25, Tank Thermal Sight.

H. WORK PERFORMED BY: Prime Contractor is: Chrysler Corporation, Detroit, MI. In-house work is being accomplished by the US Army Tank Automotive Research and Development Command Warren, MI; the US Army Armament Research and Development Command, Dover, NJ; and the Ballistics Research Laboratory, Aberdeen Proving Ground, MD.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Evaluation and selection in November 1976 of Chrysler Corporation to produce the XM1 Full-Scale-Engineering-Development pilot vehicle included competitive parametric design and cost effectiveness studies, trade-off analysis to optimize vehicle configuration, fabrication of prototype vehicles and test rigs for government competitive evaluation,

development and evaluation of manufacturing techniques for hulls and turrets, and training-devices feasibilities studies. Evaluation of the Leopard 2 (American Version) resulted in the conclusion that the tank did not meet all US requirements. In accordance with the January 1977 Addition to the Addendum to the US-German Memorandum of Understanding, both countries agreed to pursue standardization of selected components. Fabrication of eleven pilot vehicles and ballistic test sections started in FY 1977, and the first pilot vehicle was delivered to the Army in early February 1978. Deliveries of ten of eleven pilots were complete in July 1978; with the eleventh vehicle retained at the Detroit Army Tank until the end of August 1978 to check out engineering fixes applied to the Operational Test (OT) II vehicles in August and to selected Development Test (DT) II vehicles in September and October 1978. The DT/OT II test program began in March 1978 and May 1978 respectively.

2. FY 1979 Program: OT II will be completed on 2 February 1979, and the results of this evaluation coupled with DT II results will contribute to decisions of the Army and Defense System Acquisition Review Councils (ASARC/DSARC) III to proceed into Low Rate Initial Production (LRIP) of the XM1 tank. Contract award for the first 110 production model XM1's is scheduled for May 1979, and DT II will be completed by the end of July 1979. Redesign and testing will be conducted, as required, to correct engineering shortcomings noted during DT/OT II. Development efforts will continue in improved armor design, cost reduction techniques, configuration management, product assurance to include engine durability testing, integrated logistic support, training device development, unit production cost tracking, and life cycle cost activities. In addition, detailed planning for DT/OT III will begin. The decreased funding requirements for FY 1979 reflect a reduction in hardware costs required for Full Scale Engineering Development and the transition to the LRIP phase of the XM1 acquisition program.

3. FY 1980 Planned Program: The Full Scale Engineering Development contract with Chrysler Corporation ends in November 1979. Major efforts will focus on the Development and Operational Tests (DT/OT) III to include their support; data collection; and analysis of results; final correction of engineering fixes, if required; and provision of contractor support. LRIP vehicles will be used during DT/OT III. Work in training device development, integrated logistic support, and configuration/data management will be completed.

4. FY 1981 Planned Program: The DT/OT III will be completed in December 1980 and a decison on the readiness of the system to enter full production and development will be made in February 1981. Type classification Standard is planned to be accomplished during the decision review process.

5. Program to Completion: This is a continuing program. FY 1982 and FY 1983 funds will support issuance of production model XM1's to troop units (Project Handoff) with design engineering efforts as required.

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: Development Test (DT) II is being conducted by the US Army Test and Evaluation Command with independent evaluation being performed by the US Army Materiel Systems Analysis Agency. DT II started in February 1978 and is scheduled for completion by the end of July 1979. The test program will utilize a total of eleven pilot vehicles and one ballistic hull and turret. The test program is presently in its twelfth (January 1979) of eighteen (February 1978-July 1979) months of DT II. Government testing of the Chrysler produced tank is being performed at Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; and White Sands Missile Range, NM. The objectives of the test program are to determine the degree to which the XM1 meets its Materiel Need (Engineering Development) and/or system specification requirements, to assess performance of the pilot tank in relation to the baseline tank, the M60A1 (Reliability Improved Selective Equipment (RISE)), and to demonstrate that full-scale engineering is reasonably complete and that solutions to all significant design problems are in hand. Data and results of the test program will be used by the Army and Department of Defense Systems Acquisition Review Councils (ASARC/DSARC III) (March-April 1979) to make a decision concerning initial production of the 105mm gun XM1 tank, as well as by the Army and Chrysler Corporation to assure the tank has reached the required state of design maturity. Thus far, testing has been completed in the following areas: system safety, mobility, nuclear radiation, sighting, gun stabilization, desert dust test, and electromagnetic pulse tests. To date DT II and Operational Testing resulted in the identification of a number of design shortfalls principally involving the air induction, hydraulic and fuel management/scheduling systems; engine; track and suppression; and selected fire control components. To facilitate system availability and data collection, modifications to correct the shortfalls initially identified were applied to DT II pilot vehicles during September and October 1978. The effectiveness of these and subsequent fixes are undergoing evaluation. In excess of 20,000 miles of test data in support of Reliability, Availability, Maintainability, and Durability (RAM-D) has been collected as of 1 January 1979 towards the goal of 30,200 RAM-D miles by ASARC and a total of 55,700 RAM-D miles of Government testing during Development Test/Operational Test (DT/OT) II. The contractor will collect data on an additional 42,000 RAM-D miles. Results of the previously mentioned modification efforts demonstrated a reduction in initial RAM problems. The RAM-D test phase of the program has been structured to assure that XM1 RAM growth is progressing satisfactorily to achieve the system requirements. All subsystems will be tested to provide the necessary data for environmental performance evaluations. Total testing of the XM1's desert mobility performance and arctic DT testing will take place in the third and fourth quarters of CY 1979. The FSED vehicle differs from the prototype tested during the Validation Phase in that it incorporates provisions for standardization of selected components and/or systems between the XM1 and Leopard 2 in accordance with the Addendum to the United States/Germany Memorandum of Understanding, in addition to changes as a result of lessons learned during DT I/OT I. The standardization effort has as one of its major objectives commonality of logistical support in the area of consumables, such as fuel and ammunition, and in those other areas requiring substantial logistical support, such as the gun, track, engine, transmission, and fire control. Comments on past and future XM1 development test systems follow:

a. Prior Development Testing: Phase I of DT I was conducted by the US Army Test and Evaluation Command (TECOM) at Aberdeen Proving Ground, MD, during the period 1 February-30 April 1976 to resolve critical development issues and provide data for selection of either the Chrysler or General Motors XM1 prototype vehicle and the decision to enter FSED. Testing of US

prototypes was completed on schedule with both vehicles having successfully demonstrated the ability of meeting or exceeding all XM1 requirements. Selection of the prototype XM1 for full-scale development, initially scheduled for July 1978, was deferred 120 days by the Secretary of Defense pending the outcome of a resolicitation period to consider incorporation of standardized components in accordance with the 28 July 1976 Addendum to the Memorandum of Understanding (MOU) with the Federal Republic of Germany. On 12 November 1976, the Source Selection Authority announced selection of Chrysler Corporation for the Full-Scale Engineering Development contract. Phase II, testing of the Leopard 2 (Americanized version), began on 10 September 1976 and was completed in mid-December 1976. The Leopard 2 (Americanized version) did not meet all XM1 requirements. The performance of all candidate systems was evaluated against the performance of the baseline vehicle, the M60A1 with Add-On Stabilization (AOS). In the January 1977 Addition to the Addendum to the MOU, the US and Germany agreed not to pursue competition on a total tank basis, but, rather to limit interoperability/standardization efforts to subsystems/components only.

b. Follow-On Testing: Development Test (DT) III is scheduled to be conducted during the period March to December 1980 by the US Army Test and Evaluation Command (TECOM) at Aberdeen Proving Ground, MD, and the US Army Tropic Regions Test Center, Panama Canal Zone. The test program will verify production changes resulting from Development Test/Operational Test (DT/OT) II deficiencies; validate the quality of the production model XM1; generate additional reliability, availability, maintainability, and durability data; and support a decision to enter full-scale production and development of the XM1 tank system.

2. Operational Test and Evaluation: Operational Test (OT) II is being conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Bliss, TX. Test tank crews and support personnel are provided by the 3d Armored Cavalry Regiment. OT II started in May 1978 and is currently scheduled for completion on 2 February 1979. The objective of the test program is to provide data and associated analysis of the operational effectiveness and military utility of the XM1 to the Army and Defense Systems Acquisition Review Councils III (ASARC III and DSARC III). Test objectives are to assess operational capabilities of the XM1 in regard to fightability; survivability; mobility; and Reliability, Availability, and Maintainability and Durability (RAM-D). Phase I of OT II, training of XM1 crews and support personnel, was completed in early August and was followed by a Chrysler modification period to correct engineering design shortfalls detected during the training phase. The modification period caused a six week delay in the original schedule. Phase II, individual tank precision fire testing, commenced on 5 September. Phase III, platoon battle run testing, started in early November 1978 and is scheduled for completion on 2 February 1979. The test program is on the revised schedule and fulfilling test objectives. The five XM1 test vehicles are programed to accumulate 2500 miles and fire 500 main-gun rounds during the latter two phases of the test program. The data generated will contribute to the overall XM1 RAM-D analysis. Results of the ongoing test program will be available in mid-March 1979 to support the XM1 milestone III decision process. Comments on past and future XM1 operational test programs follow:

a. Prior Operational Testing: Phase I of OT I was conducted by OTEA at Aberdeen Proving Ground, MD, during April 1976. This test was a combined development and operational test using one prototype vehicle and one automotive test rig from each contractor (Chrysler and General Motors), and employed six typical user tank crews. Both candidates met the operational

effectiveness objectives required at this stage of development, and nothing was noted during Operational Test I (OT I) which would preclude entry into engineering development. Phase II of OT I, prototype testing of the Leopard 2 (Americanized version), was completed in December 1976 at Aberdeen Proving Ground, MD, by the US Army Operational Test and Evaluation Agency (OTEA) against the same test criteria used to evaluate the US competitive candidates.

b. Follow-On Testing: OT III will be managed by OTEA and conducted by the US Army Training and Doctrine Command (TRADOC) Combined Arms Test Activity (TCATA) at Fort Hood, TX, during the period June to December 1980. This will be a battalion level test utilizing troops from Fort Hood armored units. The test will evaluate all transition training; formal military school training; logistical requirements; and validation of doctrinal, tactical, and operational concepts. Reliability, availability, and maintainability (RAM) data also will be collected. Data and analysis will support a full production decision scheduled in February 1981.

3. Systems Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance (DT/OT I)
Acceleration (hard surface 0 degree slope, 0 to 20 mph) (sec)	6-9	6.2
Speed (mph)		
10% slope	20-25	24
60% slope	3-5	5.2
Maximum	40-50	45
Cruising range (miles)	275-325	280 1/
Horsepower/Weight (ton)	26-30	26.1
Height (inches)	90-95	93.5 2/
Width (inches)	120-144	143.8 2/
Stowed ammunition (main gun rounds)	45-55	55
Reliability (Mean Miles Between Failure - MMBF)	320-360	3/
Durability (miles)	4000-6000	4/
Availability (inherent)	86-92%	4/
Maintenance ratio (maintenance/ operational)	0.66-1.25	4/

Program Element: #6.46.20.A
DoD Mission Area: #412 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

1/ Calculated based on fuel quantity proposed for Full Scale Engineering Development (FSED) vehicle.
2/ Entries are projected measurements for FSED vehicle. Selected Acquisition Report (SAR) entries are Validation Phase prototype measurements.
3/ Eighty-five percent of goal to be demonstrated by end of Development Test/Operational Test (DT/OT) II.
4/ To be demonstrated by end of DT/OT III.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.21.A
DOD Mission Area: #413 - Fire Support

Title: COPPERHEAD (Cannon Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	35999	12983	7108	8000	0	148508
D073	COPPERHEAD	35999	12983	7108	8000	0	148508

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The COPPERHEAD is designed to attack both stationary and moving hard point targets such as tanks with a high probability of achieving first round kills. The projectile is fired from a conventional 155mm Howitzer toward a target which has been illuminated by a forward observer using a laser designator. During the final phase of the trajectory, the projectile acquires and homes on the laser energy reflected from the target. This projectile will satisy the need for field artillery units to possess the capability to effectively attack armored targets of the numerically superior Warsaw Pact Forces at ranges beyond the capability of direct fire antitank weapons. The high single shot kill probability coupled with the ability to attack both stationary and moving targets will significantly improve the Army's antitank capability within the existing force structure.

C. BASIS FOR FY 1980 RDTE REQUEST: The Engineering Development (ED) contractor will deliver the Reliability, Availability, and Maintainability-Development (RAM-D) report, final technical report and final contract report in FY80. The contract is scheduled for completion in the 2nd quarter FY80. The remainder of Prototype Qualification Testing (Storage reliability tests) will be completed and final test reports will be prepared during this period. The Naval Avionics Center (NAC) will continue technical data package (TDP) validation efforts during this period.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiate Advanced Development	Feb 72	Feb 72
Initiate Engineering Development	Jul 75	Jul 75

Program Element: #6.46.21.A
DOD Mission Area: #413 - Fire Support

Title: COPPERHEAD (Cannon Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiate DT/OT II	Mar 78	Mar 78
Defense Systems Acquisition Review Council (DSARC III)	Sep 79	Mar 79
Initial Operational Capability (IOC)		

The change in milestone dates resulted from the necessity to restructure the program schedule due to correction of hardware deficiencies discovered during initial test firings.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	35999	12983	5231	0	137876

Program schedule was modified to assure that all technical problems had been resolved and that design fixes and manufacturing processes had been thoroughly tested before fabricating the Engineering Development (ED) projectiles to be used in Government tests. Additionally, action was taken to assure that only projectiles with titanium base gyros would be delivered for Government tests. These two actions were the primary reasons for increasing the budget request for FY 1980 and FY 1981.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army						
Funds (current requirements)	21800	18200	66200	128500	990800	1225500
Funds (as shown in FY 1979 submission)	21800	55800	275100	-	731200	1083900

Program Element: #6.46.21.A
DOD Mission Area: #413 - Fire Support

Title: COPPERHEAD (Cannon Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Quantities (current requirements)	0	0	4000	7000		
Quantities (as shown in FY 1979 submission)	0	3000	22000	-		—

The change to the procurement profile was necessitated by the slip to the development program, noted above, and the attendant delay in initiating hardware procurement.

Program Element: #6.46.21.A Title: COPPERHEAD (Cannon Launched Guided Projectile)
DOD Mission Area: #413 - Fire Support Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: A requirement exists to increase the indirect fire capability of field artillery cannon units by providing projectiles that, by use of a ballistic trajectory coupled with terminal guidance, will acquire and home on stationary and moving, hard, point targets. The projectile under development, the COPPERHEAD, will satisfy that requirement. The COPPERHEAD concept involves the firing at hard, point targets from cannon artillery as directed by a ground or air observer. During the final portion of the trajectory, the observer illuminates the target with a narrow beam laser. The COPPERHEAD then acquires the reflected laser energy and guides to the target by homing on the reflected energy. The COPPERHEAD is a 155mm guided projectile which utilizes semi-active laser homing and proportional navigation guidance. It is designed to have a range of 16 to 24 kilometers and carries a shaped charge warhead that can penetrate
The COPPERHEAD will complement rather than replace available and planned projectiles in field artillery cannon units.

G. RELATED ACTIVITIES: The COPPERHEAD project is related to program elements 6.47.30.A (RPV (Remotely Piloted Vehicle)) and 6.44.38.A (GLLD (Ground Laser Launch Device)) where work is being performed to develop laser designators for use by forward observers. An extensive effort has been undertaken to insure maximum component commonality between the Army 155mm (millimeter) projectile and the Navy 5-inch projectile in order to avoid duplication of effort and to achieve maximum possible savings. To facilitate the achievement of this objective, these development programs are jointly managed with the Army established as the responsible service.

H. WORK PERFORMED BY: Martin Marietta Corporation, Orlando, FL, has contracted for system development. Responsible Government Activities include: US Armament Research and Development Command, Dover, NJ; US Army Missile Research and Development Command, Huntsville, AL; Project Manager, Cannon Artillery Weapons Systems, Dover, NJ; Test and Evaluation Command, Aberdeen, MD.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The COPPERHEAD program began in 1971 with $1.6 million emergency funds to conduct in-house systems studies. Semi-active laser homing was selected for use during the initial phase of the program because it was the most technically advanced. In February 1972, contracts were signed with Texas Instruments and Martin Marietta to conduct a two-phase competitive prototype demonstration. Phase I of the demonstration was completed in September 1973 with each contractor demonstrating the capability of projectile components to survive the 10,000 "g" cannon launch environment. Phase II was initiated in September 1973. Each contractor fabricated and delivered to the Army three fully functional prototype projectiles with telemetry for testing and tests were completed in June 1974. In January 1975,

a Special Commonality Defense Systems Acquisition Review Council (DSARC) directed the Army to continue the Advanced Development program. Each contractor delivered the last nine initial design projectiles for test and evaluation. Sixteen of these 18 prototype projectiles and six of the 12 Navy 5-Inch/155mm prototype projectiles were tested and evaluated. DSARC II was conducted in June 1975 and approval to enter engineering development was received. The Engineering Development (ED) contract was awarded to the Martin Marietta Corporation in July 1975. Warhead and fuze development will be accomplished by the subcontractor, thereby giving him complete design responsibility. The FY 197T funding was reduced by over 31 percent (from $24.8 million to $17.0 million) necessitating a complete program restructure which resulted in a program slip of six months and the initiation of ED at a lower level then initially anticipated. During FY 1976 and FY 197T, design changes to the warhead, fuze, roll-rate sensor, and seeker gyro were tested. The final two Army prototypes were successfully fired. The first one fired at a tank illuminated by a designator mounted in a Remotely Piloted Vehicle (RPV) and the second was fired at a moving tank illuminated by a helicopter-mounted designator during darkness. The priority of component testing was completed and subsystem development testing was continued. During FY 1977 subsystem testing was completed and the first series of all up round baseline tests were conducted at White Sands Missile Range (WSMR). Producibility Engineering and Planning (PEP) was initiated in December 1976 under congressional imposed dollar and time constraints. PEP constraints were lifted in April 1977. Initiation of FY78 RDTE activities was delayed until November 1977 as a result of late release of funds. The program was restructured to reflect the impact of the fund delay. During FY78 the preliminary TDP was delivered by the contractor and reviewed by government personnel. Naval Avionics Center (NAC) initiated technical data package (TDP) validation efforts in December 1977. Prototype Qualification Tests (PQT) were initiated in March 1978. The Initial Production Facilities (IPF) contract was awarded in December 1977.

2. FY 1979 Program: PEP is planned for completion during this period as well as the bulk of prototype Qualification Tests and Development Test/Operational Test (DT/OT II). The IPF contract effort and the Naval Avionics Center Technical Data Package validation effort will continue during this period. DSARC III is planned for September 1979.

3. FY 1980 Planned Program: The ED contract is planned for completion in the 2nd Quarter. DT II testing (storage reliability) will be completed and final reports will be prepared upon completion of ED efforts. TDP validation efforts will be continued during this period.

4. FY 1981 Planned Program: RDTE funding in FY 1981 is required to support the conduct of DT III, the completion of NAC TDP validation activities and to support final design-to-unit production cost (DTUPC) award fee requirements.

5. Program to Completion: This program terminates in FY 1981.

Program Element: #6.46.21.A
DoD Mission Area: #413 - Fire Support

Title: COPPERHEAD (Cannon Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation: The development contractor is the Martin Marietta Corporation, Orlando, FL. A competitive feasibility demonstration of the Martin Marietta and Texas Instruments advanced development (AD) versions of the COPPERHEAD was completed in April 1975. Targets included panels and both stationary and moving tanks at ranges from 4 to 16 kilometers. The Texas Instruments version achieved one hit out of twelve rounds fired. The Martin Marietta version achieved 8 hits out of 12 rounds fired including two hits on moving tanks, a hit on a stationary tank that had been designated from a remotely piloted vehicle, and a hit on a moving tank designated by the Airborne Target Acquisition and Fire Control System (ATAFCS). Prototype Qualification Tests for the engineering development version began in March 1977 and are being conducted primarily by the US Army Test and Evaluation Command (TECOM) at White Sands Missile Range (WSMR). Major subtests include basic performance, environmental qualification, battlefield environment, cold weather performance and range performance and reliability. Nuclear effects, nuclear-biological-chemical decontamination, air transportability and electromagnetic radiation effects will also be tested and firing table data determined. Approximately 50% of the first 25 DT II (Development Test II) firings resulted in projectile failures. These failures were found to be primarily due to a combination of a deficiency in the aerodynamic design and an inadequate gyroscope. The design was modified and new materials were incorporated into the gyroscope. Of the next eight rounds fired in this new configuration, seven were completely successful. Development Test III (DT III) will be conducted by TECOM at WSMR in October 1980 to verify that the low rate initial production projectiles meet system specifications when manufactured in accordance with production processes.

2. Operational Test and Evaluation: Operational Test I (OT I) was conducted at White Sands Missile Range during 25 March - 30 April 1974. Firings were not included as part of OT I as prototype projectiles were unavailable. Test results indicated that a Forward Observer (FO) section equipped with the Ground Laser Locator Designator (GLLD) could successfully complete an artillery fire mission. OT II will be conducted by the US Army Operational Test and Evaluation Agency (OTEA), independent of DT II, utilizing prototype hardware and typical user troops. The test is to be conducted during the period February - May 1979 at Fort Carson, CO. OT II will consist of two subtests and will utilize production representative hardware. The nonfire subtest phase will be conducted under conditions of day, night using night sight, and night using illumination rounds. Acquisition, tracking, engagement, training, and command-control-communications (CCC) will be addressed. During the live fire subtest phase, eighty COPPERHEAD rounds with full guidance and control will be fired against single and multiple moving target arrays. Ten will have live warheads. Conventional artillery missions will be interspersed with COPPERHEAD missions. This phase will add to the data base collected in the first phase. OTEA will provide its independent evaluation to the Army System Acquisition Review Council (ASARC) prior to entry into low rate initial production. OT III is scheduled to be conducted by OTEA independent of DT III utilizing low rate initial production hardware and typical user troops. OT III will be conducted in two phases. Phase I will be a nonfiring exercise while Phase II will be a live firing exercise. The results of Operational Testing, coupled with the Developmental Testing, will be utilized to thoroughly evaluate the reliability and maintainability of the projectile. OTEA will provide its independent evaluation to ASARC/Defense System Acquisition Review Council IIIa (DSARC IIIa) for use in the production decision.

Program Element: #6.46.21.A
DoD Mission Area: #413 - Fire Support

Title: COPPERHEAD (Cannon Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

3. System Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Weight (pounds)	150	137
Length (inches)	54	54
Accuracy (CEP-ft)1/		(during Advanced Development)
Range (km)		
Maximum	16-24	16
Minimum	1.5-3.0	4
Lethality (Probability of a kill given a hit)		*
Reliability	.96	*

* To be demonstrated during development and operational testing (DT/OT II).

1/ CEP - Circular Error Probable

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.23.A
DoD Mission Area: #412 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6515	6283	3000	0	0	31519
D072	VIPER	6515	6283	3000	0	0	31519

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The VIPER Tactical System will replace the current M72A2 Light Antitank Weapon (LAW). VIPER provides higher hit probability, greater lethality, longer effective range, and increased reliability. The VIPER system is a short-range, manportable, lightweight antitank rocket weapon which consists of a tactical round and a training kit. The tactical round consists of a free-flight, in-tube, burning rocket, which is packaged and sealed in an expendable launcher that serves as a tactical storage container. Improvement in performance over the LAW will not appreciably increase the bulk of the launcher nor increase the total system mass. The VIPER system will replace the M72A2 LAW on a one-for-one basis. VIPER will supplement DRAGON and TOW systems. Despite the high hit and kill capability of the TOW and DRAGON, some enemy tanks will survive and provide a continued threat to the combined arms team. VIPER is required to counter this threat. The primary VIPER target is the tank; however, it will also be capable of defeating secondary targets such as wheeled and tracked vehicles, bunkers, field fortifications, crew-served weapon positions, and targets in built-up areas. LAW does not have the capability to engage and defeat the advanced heavy armored tanks presently used by the Warsaw Pact nations. With twice the range and velocity of the LAW, VIPER has the greater probability of defeating the Warsaw Pact vehicles. These characteristics provide the soldier with a greater degree of survivability when confronted with armored vehicles.

C. BASIS FOR FY 1980 RDTE REQUEST: The following tasks are to be accomplished: conversion of documentation from contractor to government format; establishment of Technical Data Package for procurement; development of integrated technical documentation and manuals; and establishment of field training and maintenance teams in support of life cycle management of the VIPER system.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Begin Operational Test (OT) II	2d Qtr FY79	1st Qtr FY79
Complete OT II	3d Qtr FY79	2d Qtr FY79
DEVA IPR (Type Classification STD)	4th Qtr FY79	2d Qtr FY79

The differences in the milestone dates is a result of technical problems encountered during development testing causing a slippage in the VIPER system program. The problems have been resolved through appropriate design changes.

Program Element: #6.46.23.A
DoD Mission Area: #412 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (as shown in FY 1979 submission)	6515	6283	0	0	0	25204

The total estimated costs increase over the estimate as shown in FY 1979 RDTE Congressional Descriptive Summary was caused by cost increase and schedule stretch-out resulting from technical problems (dud rate, detente, recoil, and dispersion) encountered during FY 1977. These problems required engineering redesign, additional test quantities and tests to validate solutions. The total program, however, is within 8% of the predicted estimated costs for the VIPER System and close to the fifty month schedule predicted in FY 1975. The $3 million required in FY 1980 is attributable to the program schedule stretch-out causing some of the efforts (establish technical data package, design storate program, and physical configuration audit) previously planned for FY 1979 to be conducted in FY 1980.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
Procurement (sole source fixed price incentive)						
Funds (current requirements)						
Tactical Round	-	-	33100	31600	111600	176300
Training Round	-	-	18300	29000	77000	124300
Production Base Facilities	20000	-	-	-	-	20000
Funds (as shown in FY 1979 submission)	-	-	44000	-		
Quantities (current requirements)						
Tactical Round			91	120	435	
Training Round			475	1224	3672	
Quantities (as shown in FY 1979 submission)						
Tactical Round			156	-	-	
Training Round			885	-	-	

The differences in the funding profiles is attributed to correction of design problems which increased unit cost and inflation due to a program delay.

Program Element: #6.46.23.A
DoD Mission Area: #412 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to develop a low cost, lightweight, antitank weapon system to be used by the individual soldier for the protection from attacks by heavy tanks and armored vehicles. The VIPER will be a replacement for the currently fielded M72A2 LAW Weapon System which was first fielded in 1962. The weapon, a round of ammunition, is designed to be maintenance-free, capable of being stored for extended periods of time without significant loss of reliability, and relatively impervious to the worldwide environmental conditions. The rocket consists of a propulsion unit which includes a motor case, nozzle/fin assembly, propellant grain, and igniter/closure assembly, a warhead unit which includes a precision cone, shaped explosive charge, a point initiating element, a base detonating fuze element, and a two-conductor cable connecting the point initiating element, a base detonating fuze element. The lightweight, telescoping, single-shot, throw-away launcher consists of an inner tube, outer tube, tube locking device, mechanical sight, firing mechanism, safety interlock, closures, shoulder stop, and carry sling. Increase in weapon performance will not significantly change the mission and/or operational use from that of the LAW system. No significant logistical or organizational changes are required to accommodate the VIPER because it is issued to all combat units, i.e., infantry, engineers, cavalry units, as a round of ammunition. The disposable launcher, round of ammunition end item concept remains unchanged.

G. RELATED ACTIVITIES: Manufacturing Methods Technology programs parallel the VIPER development program in order to establish a production process for reducing the cost of manufacturing the rocket motor propellant, additive, carborane. A unique Government-owned carborane production facility is currently being colocated at Callery Chemical Company, Callery, PA. This facility utilizes existing commercial capability to manufacture ingredients necessary for production of carborane. In addition, contracts have been awarded for the metal parts initial production facility to support VIPER hardware production. PAA funds are being utilized to fund the carborane facility and the metal parts facility contracts.

H. WORK PERFORMED BY: The VIPER Advanced Development program was conducted in-house at the US Army Missile Command, Huntsville, AL, with the support of several other Government agencies. The VIPER-AHAMS Project Office, US Army Missile Research and Development Command located in Huntsville, AL, is managing the program. The prime contractor for Engineering Development is General Dynamics Corporation, Pomona, CA. Major subcontractors are: Atlantic Research Corporation, Gainsville, VA; Brunswick Corporation, Lincoln, NB; and Bulova Watch Company, Valley Stream, NY. Additionally, the Iowa Army Ammunition Plant, Burlington, IA, is loading and assembling the warhead and assembling the complete round.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Engineering design testing was initiated early in FY77; however, technical problems were encountered which prevented completion of the engineering design test as planned and subsequently caused a slip in the Engineering Development schedule. These problems included dispersion (accuracy), warhead duds, and recoil. The accuracy problem was solved and the demonstrated accuracy of 1.0 milliradians (109 rounds at ranges from 200 to 500 meters) is better than the required 1.1 milliradians. Warhead dudding and recoil problems have also been resolved through design changes. Engineering

design tests were successfully completed and hardware fabrication was initiated for Prototype Qualification Test - Contractor (PQT-C), Prototype Qualification Test - Government (PQT-G) and Operational Test II (OT II). Additionally, producibility engineering and planning effort continued through FY78. Ten foreign countries were briefed on VIPER as a result of their inquiries through FMS. Three of these countries were provided planning and budgetary data.

2. FY 1979 Program: PQT-C, PQT-G and OT II will be conducted and the system will be approved for man firing; results will be analyzed and necessary changes will be incorporated into the system design. The Development Acceptance In-process Review (DEVA IPR) will be held and the system type classified. The producibility engineering and planning effort will continue through FY79. In accordance with Congressional guidance, a comparison of VIPER with the Karl Gustaf rocket will be accomplished. The testing planned by the US Marine Corps and the Canadian Army will be utilized in this effort.

3. FY 1980 Planned Program: The FY80 funds will be utilized to finalize the technical data package and conduct the physical configuration audit concurrent with fabrication of the initial production hardware. Production validation testing will be conducted with the initial deliveries from the first production contract (awarded early in FY80) and the technical data package will be established. Integrated technical documentation and training manuals/pamphlets will be published; and field teams created to support training and maintenance for the VIPER system.

4. FY 1981 Planned Program: None, VIPER system RDTE program completed in FY 1980.

5. Program to Completion: Not Applicable.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 6.46.24.A — Title: High Mobility Weapons Carrier
DoD Mission Area: 442 - Logistics/General Combat Support — Budget Activity: 4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	2500	2400	0	4900
DH17	High Mobility Weapons Carrier	0	0	2500	2400	0	4900

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the development of a highly mobile weapons carrier required as an antitank missile carrier for nonmechanized infantry. The present missile carrier system, two M151 1/4-ton jeeps with trailer, are overloaded, unarmored, and incapable of providing the requisite degree of mobility. This program will take maximum advantage of developmental efforts conducted by civilian industry. The Army is presently examining the existing required operational capability (ROC) document to determine the full requirement for such a high mobility weapons carrier in a variety of roles.

C. BASIS FOR FY 1980 RDTE REQUEST: Funds requested provide for: development of an integrated Tube Launched Optically Tracked Wire Guided Missile (TOW) antitank missile/high mobility vehicle weapon system that will provide a significant increase in antitank capabilities to nonmechanized infantry units.

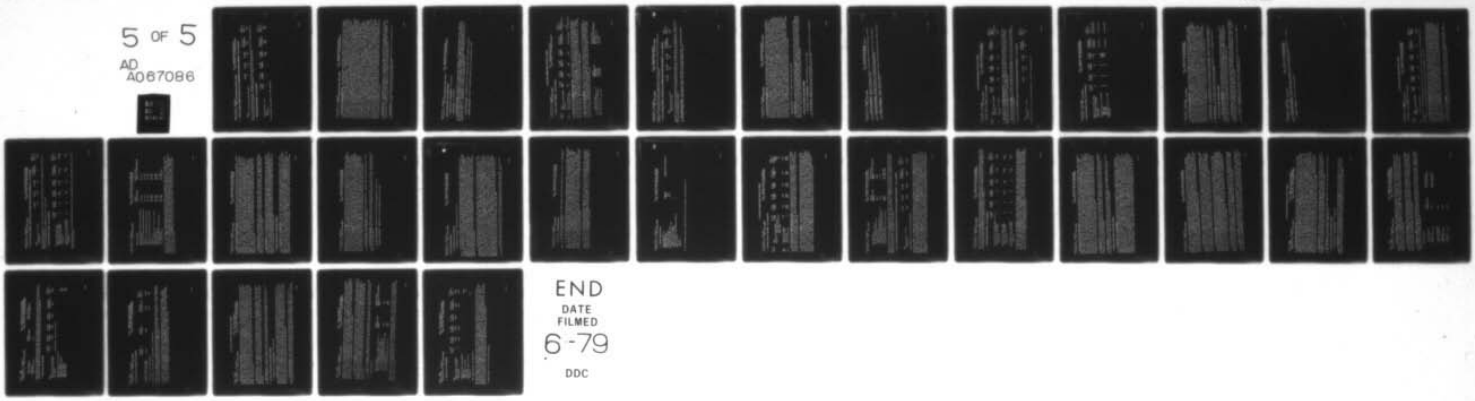
Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Release Request for Proposal (RFP) for High Mobility Weapons Carrier (HMWC)	December 1979 1/	October 1978
Award Competitive Contracts for HMWC	March 1980 1/	January 1979
Begin Shoot-Off for HMWC	January 1981 1/	September 1979

1/ Slippages due to lack of Congressional funding of FY 1979 budget request.

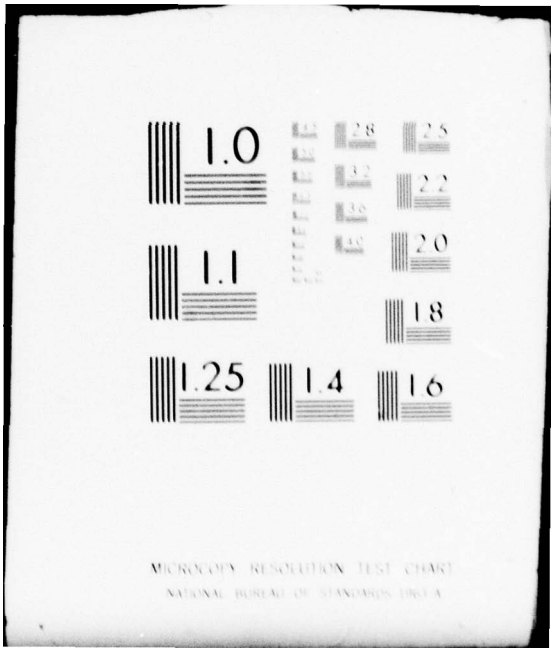
AD-A067 086 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 5/1
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
JAN 79

UNCLASSIFIED NL

5 OF 5
AD
A067086



END
DATE
FILMED
6-79
DDC


1.0
1.1
1.25
1.4
1.6
2.8
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Program Element: #6.46.24.A
Title: High Mobility Weapons Carrier
DoD Mission Area: #442 - Logistics/General Combat Support
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	0	1353	2500	2000	5853

This is a new Program Element (PE). Funding for this project was requested in PE 6.36.24 in the FY 1979 budget submission. Funding was denied by the Congress in FY 1979 resulting in a change in the funding profile.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement, Army:						
Funds	--	--	--	10100	65300	75400
Quantities	--	--	--	200	2227	2427

No procurement funding shown in FY 1979 submission.

Program Element: #6.46.24.A Title: High Mobility Weapons Carrier
DoD Mission Area: #442 - Logistics/General Combat Support Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program provides the Army with a highly mobile weapons carrier as an antitank missile carrier (the TOW missile) in Light Infantry Divisions. These divisions are part of the nation's capability to rapidly reinforce our European Forces and provide a unique capability to be immediately airlifted to any part of the world, with all of their equipment, for execution of worldwide contingency missions. This extremely rapid response is bought at the price of tanks and Armored Personnel Carriers which are available in very limited quantities within these divisions. As contingency forces, these divisions can expect to encounter hostile tanks and armored personnel carriers in virtually every country in the world. The Light Division's defenses against these armored vehicles are antitank missiles which can; however, be neutralized by artillery or small arms and which desperately require some form of protection. Additionally, because commanders must move their antitank weapons rapidly from one point on the battlefield to another, it is imperative that the antitank missile carriers have exceptional cross-country mobility. At present, the primary antitank defense of over 50,000 men in the 82d Airborne Division, the 101st Airmobile Division, and the other light Infantry Divisions is the TOW missile. Currently the TOW is mounted on two motorized platforms (M274 MULE) or two grossly overloaded M151 jeeps and a trailer. These vehicles provide absolutely no protection against the primary threat, artillery, and are grossly deficient in mobility. Additionally, even with the Army's new BLACK HAWK helicopter, two helicopters are required to lift the TOW squad (2 MULES or 2 jeeps and a trailer) which raises the distinct possibility of separation in the confusion of battle. The High Mobility Weapons Carrier (HMWC) will eliminate these deficiences within the weight constraints imposed by the helicopter lift requirements. These constraints preclude using fully armored vehicles such as the M113A1 armored personnel carrier or the Improved TOW vehicle. A significant level of armor protection against artillery and small arms will be provided which would greatly reduce casualties and the new vehicle will be a 1 for 2 replacement (1 HMWC for 2 MULES or 2 jeeps) with vastly increased cross-country mobility and tactical integrity. This lower life cycle cost system has also aroused interest in the United States Marine Corps. Other roles for the basic vehicle are developing rapidly as Army field units become aware of the capabilities of this vehicle. Developmental and production costs have been absolutely minimized through the use of vehicles that have already been developed by civilian industry. The funding requested will enable the Army to procure twelve vehicles (6 each from two manufacturers) which will be pitted against one another in a competitive "shoot-off." This innovative approach to a weapons system procurement results in a maximum utilization of the capabilities existing within industry.

G. RELATED ACTIVITIES: This program is related to all of the Army's research and development programs connected with tactical and special vehicles. Programs of primary interest are: Program Element (PE) 6.26.01.A, Tank and Automotive Technology; PE 6.11.02.A, Project AF22, Research in Vehicle Mobility; PE 6.21.05.A, Materials; PE 6.36.21.A, Vehicle Engine Development. Duplication of effort is avoided by review and coordination of the program at all Army management levels.

H. WORK PERFORMED BY: US Army Tank Automotive Research and Development Command, Warren, MI, has the responsibility for implementation of this program. Contractors will be selected in March 1980.

Program Element: #6.46.24.A
DoD Mission Area: #442 - Logistics/General Combat Support

Title: High Mobility Weapons Carrier
Budget Activity: #4 - Tactical Programs

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not Applicable.

2. FY 1979 Program: Not Applicable.

3. FY 1980 Planned Program: A new approach to weapon system development in the High Mobility Weapons Carrier Program will be initiated. Vehicles already developed or in an advanced stage of development by commercial firms will be integrated with the TOW antitank missile system and will engage in competitive testing. The funding request supports the procurement of six vehicles each from two competitors. This approach, if successful, will permit the Army to obtain a highly mobile antitank vehicle for nonmechanized infantry in a minimum amount of time and at minimum development costs.

4. FY 1981 Planned Program: Developmental work will be completed and the carrier moved into production.

5. Program to Completion: Program for High Mobility Weapons Carrier will be completed in FY 1981.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.26.A
DoD Mission Area: #412 - Close Combat

Title: Forward Observer Vehicle
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2655	1000	6050	3579	To be determined	To be determined
	QUANTITIES						14
DG23	Improved TOW Vehicle	2655	0	0	0	0	15278
DF23	Forward Observer Vehicle	0	1000	6050	3579	To be determined	To be determined

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Supports development to protect the Artillery Forward Observer employing the Ground Location Laser Designator (GLLD). The program will integrate the GLLD into an armored, elevated hammerhead similar to that currently used on the Improved Tow Vehicle (ITV), M901. A north-finding module to complement the GLLD for vehicular operation will be added to increase the overall responsiveness and accuracy of artillery fires. Basic M113A1 carriers will be used as the basic vehicle. New procurement of additional M113A1 carriers is not necessary to support this program. The Forward Observer Vehicle (FOV) will also use current, but upgraded, standard communications.

C. BASIS FOR FY 1980 RDTE REQUEST: The FOV, a new start in FY 79, will concentrate on the use of already developed major Government Furnished Equipment (GFE) subsystems. This request supports the timely continuation of integration engineering for this GFE. Other tasks funded are minor modifications of some GFE to enhance proper integration, and the fabrication of six prototype systems for engineering development testing (EDT). If successful, engineering development will continue and eight additional prototypes will be fabricated for operational testing.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Start Engineering Development Test II	2Q FY 1981	Not Stated
Start System Operational Testing II	3Q FY 1982	January-June 1981
Complete All Testing	3Q FY 1982	Not Stated
Production In-Process Review (IPR)	4Q FY 1982	July 1981

Program Element: #6.46.26.A
DoD Mission Area: #412 - Close Combat

Title: Forward Observer Vehicle
Budget Activity: #4 - Tactical Programs

Changes in milestones dates are due to Congressional action which reduced the FY 1979 funds for this program and a refinement of the integration work necessary to meet the requirement.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission, FOV only)	0	3700	300	6500	10500

Increased costs to integrate the Ground Location Laser Designator (GLLD) into the M901 turret, and the addition of a North-Finding Module to the program are the reasons for the cost growth in FY 1980 funding. FY 1979 funding was reduced from $3.7 million to $1.0 million by Congressional action.

E. OTHER APPROPRIATION FUNDS: Procurement will begin in FY 1982 and continue through FY 1985. An estimated $297 million will be needed to support 1142 Forward Observer Vehicle (FOV) Kits and attendant installation costs.

Program Element: #6.46.26.A
DoD Mission Area: #412 - Close Combat

Title: Forward Observer Vehicle
Budget Activity: #4 - Tactical Vehicles

F. DETAILED BACKGROUND AND DESCRIPTION: Artillery Forward Observer Teams equipped with the Ground Locator Laser Designator (GLLD) have opened a new dimension in artillery warfare--precision effectiveness to hit moving enemy targets. Because of this increased effectiveness, enemy forces will no doubt take extra measures to destroy or neutralize the US Forward Observers by using direct and indirect firepower. It is the vulnerability of Forward Observer Teams to enemy fires which requires that the Army undertake a development to protect the Forward Observer Teams and equipment to insure their combat survivability. Artillery Forward Observer Teams supporting highly maneuverable mechanized units are particularly vulnerable. Because US mechanized units rely on the mobility and armor protection of their tanks and carriers, there is little or no opportunity for the Forward Observers supporting these forces to "dig in" for protection of their personnel and equipment. Recognizing a partial solution to the problem the Army has already authorized the M113A1 armored carrier to the Forward Observer Teams supporting Tank, Mechanized Infantry and Armored Cavalry units. The task that remains is the genesis for this program request; that is, to protect the Artillery Forward Observer and equipment, especially GLLD, while conducting lasing operations in the forward battle area. The easiest and most cost effective way to accomplish this task is to integrate the present GLLD into the armored, elevated hammerhead developed for the Improved TOW Vehicle program. A lesser included effort requires the integration of a north-finding module to complement the carrier-mounted GLLD. The handheld magnetic compass normally used for this purpose is not accurate when used on or near an armored carrier. The Army intends to integrate the United States Marine Corps-developed, north-finding module.

G. RELATED ACTIVITIES: PE 6.36.31, Combat Vehicle Turret and Chassis.

H. WORK PERFORMED BY: The overall in-house program responsibility lies with the Project Manager, Improved Tow Vehicle (ITV), and the US Army Tank-Automotive Research and Development Command (TARADCOM), Warren, MI; with assistance from three other agencies: The US Army Communications Research and Development Command (CORADCOM), Ft. Monmouth, NJ; the US Army Engineering Test Laboratories (ETL), Ft. Belvoir, VA; and the US Army Missile Research and Development Command (MIRADCOM), Huntsville, AL. The prime contractor for development, Emerson Electric, current producer of the ITV, located in St. Louis, MO.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Completed development of the ITV Program.

2. FY 1979 Program: Design and fabricate an engineering model. Initiate competitive solicitations for the mounting and integration of the North-Finding Module and design of the remote controls for GLLD.

Program Element: #6.46.26.A
DoD Mission Area: #412 - Close Combat

Title: Forward Observer Vehicle
Budget Activity: #4 - Tactical Vehicles

3. FY 1980 Planned Program: Continue engineering integration, acquire materiel and parts for prototypes, and begin fabrication of six prototypes for Engineering Development Tests.

4. FY 1981 Planned Program: Complete integration of Government Furnished Equipment (GFE) into the Forward Observer Vehicle (FOV) system, write technical manuals, and conduct Engineering Development Tests.

5. Program to Completion: Continue engineering development, fabricate eight additional prototypes, complete operational testing leading to a production contract award in FY 1983.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.28.A
DoD Mission Area: #413 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	2501	1500	650	0	4658
	QUANTITIES						Not Applicable
D250	Indirect Fire Training Munition	0	2501	1500	650	0	4658

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports engineering development of low cost indirect fire training munitions for howitzers and mortars. The training rounds are full caliber projectiles which use pyrotechnic fuze spotting charges to provide realistic training to weapons crewmen and observers. The use of these munitions will permit significant savings in the annual costs of training ammunition.

C. BASIS FOR FY 1980 RDTE REQUEST: To complete development test and operational test II (DT/OT II) of the 155mm training projectile, the 60mm, and the 81mm mortar round; initiate engineering development of the 8-inch and 105mm howitzer rounds; and procure projectiles for DT/OT II.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Costs
RDTE Funds (as shown in FY 1979 submission)	0	2501	246	979	3726

FY 1980 funds were increased to initiate development of the 8-inch training projectile.

Program Element: #6.46.28.A
DoD Mission Area: #413 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	0	0	0	21600	Continuing	Not Applicable
Funds (as shown in FY 1979 submission)	0	0	0	0	Continuing	Not Applicable
Quantities (current requirements)	0	0	0	0	Continuing	Not Applicable
XM804 155mm	0	0	0	168000		
XM798 81mm	0	0	0	258000		
XM816 60mm	0	0	0	100000		
Quantities (as shown in FY 1979 submission)	0	0	0	0	Continuing	Not Applicable

Program Element: #6.46.28.A
DoD Mission Element: #413 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program supports development of a new family of artillery and mortar training projectiles which will reduce the cost of ammunition for training purposes and improve the methods of training artillery and mortar crews. Exploratory development efforts show that low cost training projectiles can be developed that will provide gunner and forward observer training at a cost substantially less than present high explosive (HE) projectiles. One of these concepts is a plastic jacketed mortar projectile filled with concrete. This projectile will provide the same exterior ballistics as the HE round and will upon impact produce a signature similar to the HE projectile. The 155mm and 105mm artillery projectiles will utilize thick walled, inert metal shells, which will be ballistically matched to the current high explosive projectile. The munitions will be fired using standard propelling charges which will provide realistic fire direction gunnery crewmen training and howitzer crewmen training. The conventional fuze will be replaced with a pyrotechnic spotting charge that provides a realistic flash, smoke, and noise to train observer personnel. The mortar rounds will use the standard fins and propelling charges used with HE rounds. The fuze will be the same as for the artillery rounds. Cost savings will be derived from reduced shell costs, fuze costs, and packaging costs. Estimated annual savings are in excess of 20 million dollars.

G. RELATED ACTIVITIES: This program element is the normal engineering development program supporting advanced development of the artillery and mortar training projectiles which was conducted in program element 6.36.28.A, Field Artillery Ammunition.

H. WORK PERFORMED BY: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; ARRADCOM, Aberdeen, MD. Contractors performing work in this area will be selected at a later date.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: All prior development in this program was conducted in program element 6.36.28.A, Field Artillery Ammunition Development. Advanced development of the 155mm artillery projectile, XM804, and 81mm mortar cartridge XM798 was initiated in FY 1977. In FY 1978 work was initiated on the 60mm mortar cartridge, XM816 using technology gained in the 81mm effort. Fuze and spotting signatures and low cost packaging designs were evaluated. Both artillery and mortar rounds were fired for ballistic characterization fuze suitability and cartridge integrity.

2. FY 1979 Program: Sufficient quantities of 155mm artillery and 60mm and 81mm mortar training projectiles will be fabricated for engineering development testing, safety testing, and the conduct of development test and operational test II (DT/OT II) testing. Development acceptance in-process reviews (DEVA IPR) will be conducted for the 155mm projectile and 81mm mortar round. Initiate engineering development of the 105mm artillery training projectile.

3. FY 1980 Planned Program: Complete Dt/OT II testing, conduct DEVA IPR and type classify the 155mm howitzer, 60mm and 81mm mortar rounds. Initiate engineering development of 8-inch training projectile.

Program Element: #6.46.28.A
DoD Mission Element: #413 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

4. FY 1981 Planned Program: Complete engineering development, conduct development test/operational test II (DT/OT II) testing, conduct DEVA IPR and type classify the 105mm and 8-inch artillery training projectiles.

5. Program to Completion: This is a continuing program.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.29.A
DoD Mission Area: #412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	174	1384	331	250	250	10033 1/
	QUANTITIES						1*
DH65	Cavalry Fighting Vehicle	174	1384	331	250	250	10033 1/

*An additional five Infantry Fighting Vehicles (IFV) will be converted to the CFV configuration for CFV Operational Test II (OT II).

1/ Excludes prior expenditure of $412,000 in Program Element 6.46.18, ARSV XM800, Project DH17.

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Armored Cavalry requires a vehicle that will permit effective operation as an integral part of the combined arms force on the modern battlefield. Suppressive automatic weapon fire to ATGM ranges and antitank capability are required. Functional requirements are long- and short-range suppression, fire stablized on the move, capability to fire from protected position, night and limited visibility capability, firepower to kill tanks and lightly armored vehicles, and mobility compatible with the XM1 tank. This program will develop the Cavalry Fighting Vehicle (CFV) XM3. The CFV is an armored, full tracked vehicle which provides armored cavalry and battalion scout squads with protected cross country mobility and vehicular mounted firepower required to perform reconnaissance and security missions. The vehicle's design uses the Vehicle Rapid Fire Weapon System-Successor (BUSHMASTER) as its primary armament system and incorporates the Tube-Launched Optically Tracked Wire-Guided (TOW) missile system in an under armor configuration. The vehicle can swim (with barrier) and is air transportable in the C141 and C5A aircraft.

C. BASIS FOR FY 1980 RDTE REQUEST: Prototype Qualification Test-Government (PQT-G) will be completed in April 1980. Five vehicles will be converted after the IFV Operational Test II (OT II) from the IFV to the CFV configuration and undergo CFV OT II testing. Producibility Engineering and Planning (PEP) effort will be completed in September 1980.

Program Element: #6.46.29.A
DoD Mission Area: #412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
RDTE					
Funds (as shown in FY 1979 submission)	174	1384	331	0	9945 1/

$250 thousand additional in FY 1981 and FY 1982 are required for modifications to Infantry Fighting Vehicle trainers and simulators for cavalry use.

1/ FY 1979 submission had an administrative error, should be 9533.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles Procurement, Army:						
Funds (current requirements)	0	0	70100	21700	2497100	2588900
Funds (as shown in FY 1979 submission)	0	0	0	0	0	0
Quantities (current requirements)	0	0	89	37	4270	4396
Quantities (as shown in FY 1979 submission)	0	0	0	0	0	0

Procurement funding was deleted during OSD/OMB review in FY 1979. Congressional action provided funds as shown for procurement of long lead items.

Program Element: #6.46.29.A
DoD Mission Area: #412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Award Producibility, Engineering, and Planning (PEP) Contract	Jun 1978	May 1978
Receive First CFV Engineering Development (ED) Vehicles	Nov 1978	Aug 1978
Begin Prototype Qualification Test-Contractor (PQT-C)	Dec 1978	Sep 1978
Begin Prototype Qualification Test-Government (PQT-G)	Jun 1979	Apr 1979
Complete PQT-G	Apr 1980	Dec 1979
Begin Operational Test II (OT II) on Cavalry Fighting Vehicle	Feb 1980	Jan 1980
Complete OT II on CFV	Jun 1980	Mar 1980
Army Systems Acquisition Review Council III (ASARC III)	Dec 1979	Jul 1980
DA In-Process Review	Jul 1980	Not Applicable

As a result of late release of design drawings, vendor delay in delivery of castings and forgings, and a shortage of selected shop skills for final assembly a three-month delay in delivery of the prototype vehicles has occurred. To maintain the Congressionally-directed IFV production date of May 1981 has required adjustments to PQT-C and PQT-G dates. Length of PQT-G has increased one month to incorporate more durability testing. Further this has required a change in OT II due to availability of CFV prototypes. FY 1979 submission ASARC date was based on long-lead item procurement funding in FY 1980. Since that submission, Congress has provided funds for long-lead item procurement in FY 1979. DA In-Process Review (IPR) will validate production readiness of CFV.

Program Element: #6.46.29.A
DoD Mission Area: #412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Doctrine change as result of 1973 Mid-East War provides increased emphasis on Armored Cavalry's capability to fight in the defense normally positioned forward to make initial contact with a mission of actively defending. Improved firepower, mobility, protection, and better surveillance/target acquisition are required. This improved capability will provide the armored cavalry and battalion scout squads a system which will further enhance their ability to accomplish reconnaissance, security, and economy of force missions. The Cavalry Vehicle must be able to operate wherever US armored cavalry regiments, mechanized infantry divisions or armored divisions are deployed and under the same terrain and environmental conditions. This system must be available by the mid-1980's. The Cavalry Fighting Vehicles (CFV) will be a modification of the Infantry Fighting Vehicle (IFV) XM2 with the basic difference being the crew size, requirements for vehicular and troop stowage, and elimination of the supplementary armament, Firing Port Weapons (FPW). The M113A1 Armored Personnel Carrier (APC) chassis with either Tube-Launched Optically Tracked Wire-Guided Missile Cover Artillery Protection (TOWCAP), Improved TOW Vehicle (ITV), or 50 caliber machine gun does not provide the survivability, long range suppression, speed nor mobility to enable it to be compatible with the main battle tank of the 1980-1990's which will be organic to the squadrons and battalions.

G. RELATED ACTIVITIES: Program Element (PE) 6.46.17.A, Vehicle Rapid Fire Weapon System supports the Cavalry Fighting Vehicle (CFV) program by providing for a 25mm automatic gun for use as the primary weapon on the vehicle. The Infantry Fighting Vehicle (IFV), PE 6.46.16.A provides funds for development of a vehicle which with the exception of firing port weapons, crew size, and internal stowage is identical to the CFV.

H. WORK PERFORMED BY: The CFV engineering development is being conducted by the FMC Corporation, San Jose, CA. Major subcontractors involved in this program are General Electric, Pittsfield, MA; Cummins Engine Co, Columbus, IN; and Hughes Aircraft Co, Culver City, CA. Support, as required is being performed by the US Army Tank Automotive Research and Development Command, Warren, MI; US Army Armament Research and Development Command, Dover, NJ: US Army Electronic Research and Development Command, Fort Monmouth, NJ; US Army Missile Research and Development Command, Huntsville, AL; and the Project Manager, Tube-Launched Optically Tracked Wire-Guided Missile (TOW), Huntsville, AL.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The Scout development program was added to the Mechanized Infantry Combat Vehicle (MICV) Systems Office in July 1975 as the result of a Scout Task Force Study which established the requirement for a Scout vehicle based on the MICV configuration. Additional US Army Training and Doctrine Command (TRADOC) studies further established the need to provide the Scout with armor protected, long range antiarmor capability to be provided by a TOW/BUSHMASTER Armored Turret (TBAT). Development was planned as a 20 month Advanced Development (AD) effort followed by a 40 month Engineering Development (ED) period conducted in parallel with the MICV ED program. In August 1976, a MICV Task Force was established to study and make recommendations on issues evolving from the development of the MICV and Scout systems. This Task Force concluded that a single

fighting vehicle should be developed for the Infantry and Scout roles, and that the final configuration should have a 2-man TOW/BUSHMASTER Armored Turret (TBAT). The Secretary of the Army approved the recommendations of the Task Force in November 1976 and the development of the new Fighting Vehicle was begun with the award of a sole-source letter contract to FMC Corporation. The Mechanized Infantry Combat Vehicle (MICV) and Scout programs were subsequently combined so that cost savings could be realized from maximizing the commonality of configurations and conducting concurrent testing. In July 1977 the MICV Systems Office was officially redesignated as the Fighting Vehicle Systems (FVS) Office with the MICV renamed the Infantry Fighting Vehicle (IFV) XM2, and the MICV/Scout the Cavalry Fighting Vehicle (CFV) XM3. The Producibility Engineering and Planning (PEP) contract was awarded in June 1978. Inital TOW firings were successfully conducted in July 1978. A Congressionally-directed study, Crizer Task Force, confirmed the requirement for and current design of the IFV/CFV. Further, it recommended against developing a more survivable vehicle at this time. As directed by the Office of the Secretary of Defense, a study of less costly derivatives and force structure changes was conducted. Results of the Mahaffey study were that the current IFV/CFV program is the best in terms of cost and operational effectiveness among all derivative type vehicles considered.

2. FY 1979 Program: Prototype vehicles were received in November 1978. Prototype Qualification Test-Contractor (PQT-C) was initiated in December 1978. PEP effort continues.

3. FY 1980 Planned Program: PQT-C testing will be concluded in April 1980. Five vehicles will be converted after the IFV Operational Test II (OT II) testing from the IFV to the CFV configuration and undergo CFV OT II testing. PEP effort will be completed in September 1980.

4. FY 1981 Planned Program: Modification to IFV trainers and simulators for Cavalry use.

5. Program to Completion: Completion of trainer and simulator effort in FY 1982.

J. TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Development Contractor - FMC Corporation, San Jose, CA.

b. The Mechanized Infantry Combat Vehicle (MICV) entered engineering development without undergoing Development Test I (DT I). The extensive effort since 1964 on the MICV program assured program worth and readiness to warrant commitment of resources to full scale development in accordance with established policy. This concept validation effort included hardware development and testing such as: (1) test of six XM701 (MICV-65) prototype vehicles; (2) testing of four different weapon station stabilization systems; (3) hull mockups and firing tests against different thicknesses and materials of armor plate; (4) testing of various engine and transmission candidates; (5) development and prototype testing of a suspension prototype designed to provide the hypermobility characteristics required; and (6) testing of various other subsystems such as night vision periscopes, auxiliary water propulsion devices, gun systems both in the stabilized weapon platform and through vehicle firing ports. The results of these evaluations allowed establishment of firm requirements regarding wheels vs track; size of crew, weapon, and vehicle stabilization; weight, and other characteristics.

c. Prototype Qualification Test-Government (PQT-G) (Development Test II) for the MICV officially started 1 October 1975 at Aberdeen Proving Ground (APG), MD, and Yuma Proving Ground (YPG), AZ. However, due to the lack of improved performance by the transmission, testing was stopped at the end of January 1976. Contingency plans for corrective action were initiated on 2 February 1976. PQT-G was restarted on 4 October 1976 and continued through March 1977 when the MICV/20mm program was terminated. There has been a net increase in vehicle weight of approximately 3000 pounds which is primarily attributable to the design change from the one-man fighting station to the two-man TOW BUSHMASTER Armored Turret (TBAT-II). During development testing, areas of concern were identified which resulted in vehicle redesign or consideration for changes in requirements. Specific instances were: (1) introduction of a water barrier for swimming due to marginal vehicle freeboard during water operation; (2) repackaging of the power pack and cooling system as an integrated unit for ground hop capability; and (3) consideration of a two-man weapon station resulting from operational tests which identified limited commander command and control capability in his hull location as well as highly complex gunner operations in mission performance. Testing was accomplished by US Army Test and Evaluation Command (TECOM) using civilian technicians and test center military personnel. PQT-G for the new generation Infantry Fighting Vehicle/Cavalry Fighting Vehicle (IFV/CFV) will be started in June 1979 and conclude in April 1980.

d. An Initial Production Test (IPT) will be initiated in October 1981, to be concluded in July 1982. These test will be conducted by TECOM at APG, YPG, and Fort Greely, AK, using civilian technicians and test center military personnel.

Program Element: #6.46.29.A
DoD Mission Area: #412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: #4 - Tactical Programs

2. Operational Test and Evaluation:

a. The MICV was in full engineering development without having undergone Operational Test I (OT I). See paragraph 1b above for the rationale behind this action.

b. An Operational Climatic Test/Force Development Test and Experimentation (OCT/FDTE) was conducted during January-March 1976. The test was conducted at Fort Knox, KY using US Army Forces Command (FORSCOM) troops as player participants. The Operational Climatic Test provided limited data on capabilities, limitations, and safety aspects of the Mechanized Infantry Combat Vehicle (MICV) system in European winter thaw conditions. The FDTE developed mobility/movement rate data on the MICV. Operational Test II (OT II) was conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Benning, GA, using mechanized infantry troops as player participants. The test vehicles were armed with the M139 20mm automatic cannon as the interim main armament pending production of the Vehicle Rapid Fire Weapons System--Successor (VRFWS-S). The test started 4 October 1976 and ran until 31 January 1977 at which time a need for additional user training and 20mm gun modifications became apparent due to complexity of the one-man fighting station. As a result of termination of the MICV/20mm program in March 1977, the scheduled restart of this test was cancelled.

c. OT II for the CFV will be conducted after completion of OT II for the Infantry Fighting Vehicle (IFV) using typical armored cavalry troops in an armored cavalry platoon. Refresher Cadre training begins in January 1980, and user training and testing is scheduled to start in February 1980 and will run for four months. OT II for the Cavalry Fighting Vehicle (CFV) will be conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Carson, CO. A Follow-On Evaluation (FOE) is tentatively scheduled for initiation in 2d Qtr FY82.

Program Element: 6.46.29.A
DoD Mission Area: 0412 - Close Combat

Title: Cavalry Fighting Vehicle (CFV) XM3
Budget Activity: 04 - Tactical Programs

3. Systems Characteristics:

Operational/Technical Characteristics	Objective	Demonstrated Performance 3/
Maximum Speed (mph)	40-45	
Cruising Range (miles)	300	
Acceleration 0-30 mph (sec)	18-22	
Stabilization Accuracy on a 4 mil target (% time on target)		
Single Shot Accuracy to 1000 meters (round to round standard deviation)		
Armor Protection		
Frontal		
Side, Rear		

3/ *To be determined during* Prototype Qualification Test-Government, and Operational Test II.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.30.A
DoD Mission Area: #412 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1400	35600	51890	46590	15100	150580
	QUANTITIES: Ammunition (Rounds)						29200
	Cannon (Tube and Breech)						22
	Spare Tubes						41
D060	120mm Gun Development	1400	7000	2800	2300	1700	15200
D064	120mm Tank Gun Ammo Development	0	14200	18700	21400	4500	58800
D287	Tank Gun Integration	0	14400	30390	22890	8900	76580

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for technical translation and adaptation of the Federal Republic of Germany (GE) 120mm smoothbore gun system to US manufacturing methods, US development of improvements to this system and integration of the system into the XM1 tank. This program is required to assure the availability of a future tank main armament system for the XM1 tank to counter the threat of the mid-1980's and beyond and to maintain a high degree of standardization with one of our most important NATO allies.

C. BASIS FOR FY 1980 RDTE REQUEST: Breech engineering design work will be completed and engineering development tests will be conducted. Verification, validation and safety testing of the 120mm smoothbore gun tube will be completed and hardware ordered for system development and operational testing (DT/OT II). Validation and verification testing of the German designed 38mm penetrator core Armor Piercing Fin Stabilized Discarding Sabot Tracer (APFSDS-T) kinetic energy round with a US designed staballoy penetrator will be completed as will the High Explosive Antitank Target Practice (HEAT-TP) round. Additional test quantities of these rounds for development and operational testing will be ordered. Engineering design testing of a modern technology APFSDS-T round will be initiated. System integration activities will continue with component design, fabrication of hardware and refurbishment of two XM1 pilot tanks to 120mm gun configuration for contractor testing (PQT-C) and physical teardown/maintenance evaluation. Procurement action for 120mm gun XM1 weapon system hardware for system DT/OT II will be initiated.

Program Element: #6.46.30.A
DoD Mission Area: #412 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Tank Main Armament Decision	2QFY78	2QFY78
Start US Development Integration of 120mm Gun System	2QFY79	3QFY78
Complete 120mm gun XM1 Tank System Development and Operational Testing (DT/OT II)	FY82	FY81
Convene Defense Systems Acquisition Review Council (DSARC III)	4QFY82	Not Applicable
First 120mm Gun XM1 Tank Production Delivery	4QFY84	Not Applicable

Where current milestone dates differ from those reflected in the FY 1979 submission, the differences are due to delayed Congressional approval of a FY 1978 reprograming request for funds to initiate the program and to the lack of a satisfactory licensing agreement with the Germans for US production of their 120mm gun system. To date these factors have necessitated a slip in the planned program schedule of approximately nine months.

D. BASIS FOR CHANGE BETWEEN FY 1980 AND FY 1979 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

RDTE	FY 1978	FY 1979	FY 1980	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1979 submission)*	1400	8100	35800	46600	93950

*Program Element 6.36.16.A in FY 1979 submission.

The FY 1979 submission recognized that the funding requirements were contingent upon selection of a 120mm gun system and final program definition. The FY 1979 budget request ($8.1 million) was submitted prior to selection of a 120mm gun system with full knowledge that a reprograming request would be required should a 120mm gun system be selected for future incorporation into the XM1 tank. Following the 30 January 1978 decision to adapt the German 120mm smoothbore gun system for the XM1 tank, a clearly defined program for US development effort and integration into the XM1 was approved by the Army Systems Acquisition Review Council (ASARC) in April 1978 and subsequently by the Office of the Secretary of Defense (OSD). The current program reflects a scope of effort and a development schedule significantly different from that envisioned in the FY 1979 submission. The differences in the funding profiles, therefore, reflect variation in schedule, additional scope of effort such as protection/survivability testing, refurbishment of a second XM1 pilot tank to 120mm configuration for physical teardown/maintenance evaluation and development of a

modern technology kinetic energy round, as well as refinement of estimates. Execution of the planned program was delayed due to the lack of a satisfactory 120mm gun system licensing agreement with the Germans. Consequently, some further adjustments, along with additional funding, may be required in FY 1982 and beyond to align the current funding profile with a revised schedule, to restore funds deleted in FY 1979 and to accommodate the effects of inflation.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles, Army						
Funds (current requirements)	0	0	0	6200	3900	10100
Funds (as shown in FY 1979 submission)	0	0	0	0	0	0
Ammunition Procurement, Army						
Funds (current requirements)	0	0	15000	20405	217400	252805
Funds (as shown in FY 1979 submission)	0	0	0	0	0	0
Quantities (current requirements)	0	0	0	0	77000	77000
Quantities (as shown in FY 1979 submission)	0	0	0	0	0	0

At the time of the FY 1979 submission, a decision regarding a follow-on main armament system for the XM1 tank had not been made. Consequently, no funds were programed for construction or procurement. The current estimates reflect the 30 January 1978 decision to select the German 120mm smoothbore gun system for future incorporation into the XM1 tank and are based on first production delivery of a 120mm gun XM1 tank system in FY 1984. Funds shown under "Weapons and Tracked Combat Vehicles" represent tooling and facilitization of Watervliet Arsenal to produce the 120mm gun. Funds shown under "Ammunition Procurement" represent requirements for licensing fees, Manufacturing Methods and Technology (MM&T) projects, 120mm ammunition facilitization, and procurement of ammunition for initial fielding of the 120mm gun XM1 tank system.

Program Element: #6.46.30.A
DoD Mission Area: #412 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: This program is an outgrowth of the 1975 Tripartite (United States, United Kingdom and Federal Republic of Germany - US, UK and GE) Tank Main Armament Evaluation to determine an optimum future tank main armament system, a continuing analysis of future armor threats and recognition of NATO harmonization/standardization efforts. This Program Element consists of three projects, D060 - 120mm Tank Gun Development, D064 - 120mm Tank Gun Ammunition Development, and D287 - Tank Gun Integration, and was originally established in response to Congressional guidance which specified that testing and evaluation of alternative 120mm gun systems should be conducted as a parallel program, separate and apart from the funding of the XM1 program. Evaluation of alternative tank main armament systems was completed in December 1977 and on 31 January 1978, the Army formally announced the selection of the GE 120mm smoothbore gun system for adaptation to US manufacturing methods and future incorporation into the XM1 tank. The objectives of this program include translation and adaptation of GE technology to US manufacturing methods, verification and certification of US produced hardware, development of a new Armor Piercing Fin Stabilized Discarding Sabot Tracer (APFSDS-T) kinetic energy round using US modern technology and integration of the 120mm smoothbore gun system into the XM1 to meet the threat of the mid-1980's and beyond.

G. RELATED ACTIVITIES: This program is related to Program Element (PE) 6.46.20.A, Tank XM1; PE 6.36.08.A, Weapons and Ammunition and is dependent upon technology developed under PE 6.26.18.A, Ballistic Technology and PE 6.26.03.A, Large Caliber and Nuclear Technology. Previous funding was provided initially under PE 6.36.08.A, Weapons and Ammunition, and in FY 1979 under PE 6.36.16.A, Tank Gun Cooperative Development.

H. WORK PERFORMED BY: Chrysler Corporation, Warren, MI; US Army Armament Research and Development Command, Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; US Army Operational Test and Evaluation Agency, Falls Church, VA; Rheinmetall Corporation, Duesseldorf, Germany; and other US contractors yet to be determined.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: In an effort to reach an agreement on a common future tank gun, a comprehensive Tripartite (United States, United Kingdom and Federal Republic of Germany - US, UK and GE) Tank Main Armament Evaluation was conducted in FY 1975 to determine the performance of each country's candidate system against a wide spectrum of armor arrays and evaluate the combat effectiveness of each against known and postulated enemy armor threats. From the evaluations, it was concluded that of the three calibers tested (105mm, 110mm and 120mm) the 120mm provided the best basis for future development of advanced tank weapons systems. It was recommended that an optimal main armament system, considering both smooth and rifled bore designs but based initially on the GE smoothbore system, be developed. In July 1976, the US entered into separate agreements with the UK and GE for tests of 120mm smooth and rifled bore tank main armament systems. Also in July 1976, the US agreed to an Addendum to a 1974 Memorandum of Understanding with the GE concerning LEOPARD 2/XM1 tank harmonization. This Addendum specified a decision on a 120mm gun configuration by 15 January 1977. Limited comparative firing trials were conducted in December 1976 at Aberdeen Proving Ground, MD. However, the results were not conclusive and Congressional guidance on the XM1 tank program precluded a US gun decision by 15 January 1977 and any effort to integrate either of the 120mm systems into the XM1 tank.

Accordingly, a US gun decision was postponed until 30 December 1977 to permit additional tests and evaluation of candidate systems. These tests were concluded in December 1977 and the Army's selection of the Federal Republic of Germany (GE) 120mm smoothbore system for future incorporation into the XM1 tank was formally announced to the Congress on 31 January 1977 concurrent with the submission of a reprograming request for FY 1978 funds to initiate a US 120mm gun program. An Army Systems Acquisition Review Council (ASARC) convened in April 1978 and approved the planned 120mm gun program and the Office of the Secretary of Defense (OSD) subsequently followed suit. However, since Congressional approval of the reprograming request was not obtained until late September 1978 and since a satisfatory licensing agreement with the GE for US production of their 120mm system was not concluded, the Army was precluded from initiating a 120mm gun program in FY 1978.

2. FY 1979 Program: Licensing negotiations with the GE will continue to conclude a satisfactory licensing agreement. Subsequently, design activities related to the changes necessary to install the 120mm gun system into the XM1 tank and to establish component interfaces for evaluation will be initiated. Translation of the GE technical data packages and adaptation to US manufacturing techniques will begin. Procurement actions to obtain GE hardware for initial US testing will be initiated as will initial procurement actions for extended delivery development items such as the gun mount and vehicle refurbishment components for the integration effort. Subsequent to delivery of GE hardware, initial US testing will begin. Development of a US designed multi-lug breech mechanism will be initiated as will fabrication of cannon and spare tubes for gun tests.

3. FY 1980 Planned Program: System integration activities will continue with the development of hardware and software necessary to integrate the larger gun system into the XM1 tank and assure fightability and survivability comparable to that afforded with the 105mm system. Fabrication of hardware and refurbishment of two XM1 pilot tanks to 120mm gun configuration for contractor testing and physical teardown/maintenance evaluation (PT/ME) will be completed. Validation and verification testing of the German kinetic energy Armor Piercing Fin Stabilized Discarding Sabot Tracer (APFSDS-T) round with a US Staballoy penetrator (XM827) and the German High Explosive Antitank Target Practice (HEAT-TP) round will be completed and hardware ordered for follow-on testing. Engineering design testing of a modern technology APFSDS-T round will be initiated. US breech engineering design willbe completed and hardware ordered for tank system testing. All necessary experimental work will be performed and the proposed system will be ready for full scale development.

4. FY 1981 Planned Program: Contractor testing and PT/ME using two pilot tanks refurbished to 120mm gun configuration will be completed. Fabrication of 120mm hardware to equip six XM1 tanks for development and operational testing (DT/OT II), assembly and initial delivery is planned. Development testing of the 120mm ammunition family will continue as appropriate and the XM827 APFSDS-T and XM831 High Explosive Antitank Multipurpose Tracer (HEAT-MP-T) rounds will be type classified.

5. Program to Completion: System integration activities and system DT/OT II will be completed in FY 1982. Appropriate technical data packages for US production and production planning will be completed. Development, testing, certification and type classification of remaining ammunition will continue. Type classification of the modern technology APFSDS-T round, the last to be type classified, is planned in FY 1983. The first production delivery of a 120mm gun XM1 tank is currently planned in FY 1984.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D064 Title: 120MM Tank Gun Ammo Development
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
DoD Mission Area: #412 - Close Combat Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: This program is an outgrowth of the 1975 Tripartite (United States, United Kingdom, Federal Republic of Germany-US, UK, and GE) Tank Main Armament Evaluation, a continuing analysis of future armor threats and recognition of NATO harmonization/standardization efforts. Comprehensive testing and evaluation of candidate tank main armament systems (US 105MM rifled bore, UK 120MM rifled bore, and GE 120MM smooth bore) continued through December 1977 to determine the best follow-on main armament system for the XM-1 Tank. This program implements the Army decision of January 1978 to select the GE 120MM smooth bore gun system for future incorporation on the XM-1 Tank to meet the threat of the mid-1980's and beyond. This project concentrates on translating, developing, testing, and qualifying a five round family of 120MM ammunition consisting of: a GE Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer round (APFSDS-T) modified with a US designed staballoy penetrator; a modern technology Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer round (Mod Tech APFSDS-T); a High Explosive Antitank Multipurpose Tracer round (HEAT-MP-T); an Armor Piercing, Fin Stabilized Discarding Sabot, Target Practice round (APFSDS-TP); and a High Explosive Antitank Target Practice round (HEAT-TP) for use with the 120MM-equipped XM-1 Tank. Current plans are to qualify the GE designed target practice round provided it meets US requirements by January 1980. A codevelopment plan is being explored with GE for development of the Mod Tech APFSDS-T cartridge which will incorporate the latest developments in Kinetic Energy (KE) cartridges, and will provide increased performance against the mid-to-late 1980's threat.

B. RELATED ACTIVITIES: This project is related to Program Element (PE) 6.46.20.A, Tank XM-1; PE 6.36.08.A, Weapons and Ammunition; PE 6.46.30.A, Tank Gun Cooperative Development, Projects D060-120MM Tank Gun Development and D287-Tank Gun Integration, and is dependent upon technology developed under PE 6.26.18.A, Ballistics Technology, and 6.26.03.A, Large Caliber and Nuclear Technology. Previous funding for this project was provided under PE 6.36.08.A, Weapons and Ammunition.

C. WORK PERFORMED BY: US Army Armament Research and Development Command, Dover, NJ; the US Army Test and Evaluation Command, Aberdeen, MD; and Rhinemetall Corporation, Dusseldorf, GE.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not Applicable.

2. FY 1979 Program: Upon conclusion of a satisfactory licensing agreement with Germany and Rhinemetall Corporation, US design of a HEAT-MP-T fuze, and a codevelopment effort on the Mod Tech APFSDS-T round will be initiated. Translation of the Technical Data Packages, and engineering development of the HEAT-MP-T, APFSDS-T, and HEAT-TP rounds will also be initiated. Development of the GE target practice round will be monitored to determine its ability to meet US requirements.

Project: #D064 — Title: 120MM Tank Gun Ammo Development
Program Element: #6.46.30.A — Title: Tank Gun Cooperative Development
DoD Mission Area: #412 - Close Combat — Budget Activity: #4 - Tactical Programs

3. FY 1980 Planned Program: If the Federal Republic of Germany (GE) target practice round meets US requirements, translation of the Technical Data Package and engineering development of the round will begin. Should the GE round not meet US requirements, design of a US target practice round will be initiated. The validation and verification testing of the modified GE APFSDS-T round will be completed and hardware for Development Test II (DT II) of the projectile will be procured. The Engineer Design Test of the Mod Tech APFSDS-T round will begin. Validation and verification testing of the HEAT-TP will be completed and DT II hardware procured.

4. FY 1981 Planned Program: Engineer Design Tests of the Mod Tech APFSDS-T cartridge will continue. DT II of the modified GE APFSDS-T round will be completed and the round type classified. Verification and validation testing of the HEAT-MP-T round will be completed and DT II initiated. DT II of the HEAT-TP will be initiated. If the GE designed target practice round was selected during 1980, verification and validation of the translated design will be completed. If a US training projectile was necessitated, Engineering Design Testing will be accomplished.

5. Program to Completion: This is a continuing program. During FY 1982, the target practice round will complete DT II and be type classified in 1983. The HEAT-MP-T round will also complete DT II and be type classified in FY 1982. Engineering Design Testing of the Mod Tech APFSDS-T round will be completed and DT II hardware procured. In FY 1983, the Mod Tech APFSDS-T will complete DT II and the round type classified.

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates in FY 1979 Submission
a. APFSDS-T 1/ Type Classification	4Q 82	Project not shown in FY 1979 submission.
b. Mod Tech APFSDS-T 1/ Type Classification	3Q 83	
c. HEAT-MP-T 1/ Type Classification	4Q 82	
d. HEAT-TP 1/ Type Classification	4Q 82	

Project: #D064
Program Element: #6.46.30.A
DoD Mission Area: #412 - Close Combat

Title: 120MM Tank Gun Ammo Development
Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates in FY 1979 Submission
e. APFSDS-TP 1/ Type Classification	1Q 83	

1/ Armor Piercing, Fin Stabilized Discarding Sabot Tracer (APFSDS-T); Modern Technology Armor Piercing, Fin Stabilized Discarding Sabot Tracer (Mod Tech APFSDS-T); High Explosive Antitank Multipurpose Tracer (HEAT-MP-T); High Explosive Antitank Target Practice (HEAT-TP); Armor Piercing, Fin Stabilized Discarding Sabot Target Practice (APFSDS-TP).

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Costs
RDTE						
Funds (current requirements)	0	14200	18700	21400	4500	58800
Funds (as shown in FY 1979 submission)	Not Applicable. This is a new project.					
Quantities (current requirements)						
APFSDS-T (Rounds)						1450
Mod Tech APFSDS-T (Roumds)						2850
HEAT-MP-T (Rounds)						4715
HEAT-TP (Rounds)						650
APFSDS-TP (Rounds)						1360

Project: #D064
Program Element: #6.46.30.A
DoD Mission Area: #412 - Close Combat

Title: 120MM Tank Gun Ammo Development
Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

Other Appropriation Funds ($ in thousands)

	FY 1980 Estimate 1/	FY 1981 Estimate 2/	Additional to Completion 3/	Total Estimated Cost
Procurement Ammunition, Army Funds (current requirements	15000	20405	217400	252805
Quantities (current requirements)			77000	77000

1/ FY 1980 funds are required for initial payment of licensing fees.

2/ FY 1981 funds are needed for licensing fees and Manufacturing Methods and Technology (MM&T) projects. It is envisioned that funds to initiate MM&T will be needed in FY 1979 and FY 1980 if a licensing agreement is negotiated in FY 1979. These funds will be identified or requested upon initiation of the 120MM program.

3/ The funding for completion includes $89.9 million in FY 1983 and $73.0 million in FY 1984 for facilitization. It also includes $7.6 million for procurement of 10,000 rounds in FY 1983 and $47.0 million for procurement of 67,000 rounds in FY 1984. These estimates are based on delivery of 120MM-equipped XM-1 tanks beginning in FY 1984. No Authorized Acquisition Objective (AAO) for 120MM ammunition has been determined; however, the 77,000 rounds are projected to support fielding of the system and will be adjusted according to procurement rates needed to support the AAO.

FY 1980 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D287 Title: Tank Gun Integration
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
DoD Mission Area: #412 - Close Combat Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: This program is an outgrowth of the 1975 Tripartite (United States, United Kingdom and Federal Republic of Germany - US, UK and GE) Tank Main Armament Evaluation, a continuing analysis of future armor threats and recognition of NATO harmonization/standardization efforts. Comprehensive testing and evaluation of candidate tank main armament systems (US 105mm rifled bore, UK 120mm rifled bore and GE 120mm smoth bore) continued through December 1977 to determine the best follow-on main armament system for the XM1 tank. This program implements the Army decision of January 1978 to select the GE 120mm smooth bore gun system for future incorporation on the XM1 tank to meet the threat of the mid-1980's and beyond. This project will concentrate on developing, testing and qualifying XM1 tank subsystems, i.e., gun mount, turret drive and ammunition stowage compartments, necessary to integrate the 120mm gun system into the XM1 while maintaining the survivability and fightability of the tank system.

B. RELATED ACTIVITIES: This program is related to Program Element (PE) 6.46.20.A, Tank XM1; PE 6.36.08.A, Weapons and Ammunition; PE 6.46.30.A, Tank Gun Cooperative Development, projects D060 - 120 mm Tank Gun Development and D064 - 120mm Tank Gun Ammunition Development, and is dependent upon technology developed under PE 6.26.18.A, Ballistics Technology, and PE 6.26.03.A, Large Caliber and Nuclear Technology. Previous funding for this project was provided under PE 6.36.16.A, Tank Gun Cooperative Development.

C. WORK PERFORMED BY: Chrysler Corporation, Warren, MI; the US Army Armament Research and Development Command, Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; and the US Army Operational Test and Evaluation Agency, Falls Church, VA.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: Not Applicable.

2. FY 1979 Program: Subsequent to conclusion of a satisfactory licensing agreement with the GE for US production of the 120mm smooth bore gun system, initiate design activities related to the changes necessary to install the 120mm gun system in the XM1 tank and to establish component interfaces for evaluation. Initiate procurement of extended delivery development items such as gun mount, vehicle refurbishment components, cannon and ammunition. Redesign of appropriate fire control components will be initiated and a plan for ballistic protection and survivability will be prepared. Design studies will be conducted for the gun shield, spall suppression, ammunition stowage concepts and ammunition racks. The system engineering effort for planning, guiding and controlling the technical and program activities will be established.

3. FY 1980 Planned Program: System integration activities will continue with the development of ammunition baseline vulnerability data, ammunition stowage and protection hardware, fire control equipment and main weapon mount hardware. Fabrication of hardware and refurbishment of two Full Scale Engineering Development XM1 tanks (to 120mm gun configuration) for contractor

testing, training and physical teardown/maintenance evaluation will be completed. Procurement of 120mm gun XM1 weapon system hardware for Development and Operational Testing (DT/OT II) will be initiated. Contractor activity in the areas of armor development, component test and qualification, system engineering, configuration management and product assurance will continue as will efforts directed towards preparation of an integrated logistics support package, production engineering and producibility, human factors, safety and life cycle costing. Test planning for DT/OT II will be initiated. All necessary experimental work will be performed and the proposed system will be ready for full scale development.

4. FY 1981 Planned Program: Contractor testing (PQT-C) on one pilot XM1 tank (refurbished to 120mm gun configuration) will be conducted to assess ammunition stowage, weapons and fire control performance and other related system integration factors such as human factors, fightability, safety and total system performance. A physical teardown/maintenance evaluation on a second refurbished XM1 tank will be completed. Fabrication and initial assembly and delivery of six 120mm gun equipped XM1 tanks for DT/OT II incorporating system changes resulting from contractor tests and related system development activities is planned. Contractor activities in the areas of system engineering, quality assurance and producibility engineering and planning (PEP) will continue.

5. Program to Completion: Complete 120mm gun XM1 tank system integration activities and conduct system DT/OT II in FY 1982. Prepare technical data package and complete production planning leading to 120mm gun XM1 tank system production during 1984.

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1979 Submission
Initiate integration of 120mm gun into XM1 tank	2QFY79	3QFY78
Refurbish two XM1 pilot tanks to 120mm configuration for Contractor testing and physical teardown/maintenance evaluation	FY80	FY79
Equip six XM1 initial production tanks with 120mm system for DT/OT II	FY81	FY80
Complete 120mm gun XM1 tank system DT/OT II	FY82	FY81

Milestone dates reflected in the FY 1979 Congressional Descriptive Summary assumed a 1 April 1978 start of the 120mm program. However, due to delayed Congressional approval of a FY 1978 reprograming request for funds to initiate the program and to the lack of a satisfactory licensing agreement with the Germans for US production of their 120mm gun system, the program has slipped approximately nine months.

Project: #D287 — Title: Tank Gun Integration
Program Element: #6.46.30.A — Title: Tank Gun Cooperative Development
DoD Mission Area: #412 - Close Combat — Budget Activity: #4 - Tactical Programs

7. Resources ($ in thousands):

	FY 1978 Actual	FY 1979 Estimate	FY 1980 Estimate	FY 1981 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	14400	30390	22890	8900	76580
Funds (as shown in FY 1979 submission)*	0	2400	18500		24100	45000
Quantities (current requirements)						
Ammunition						18200
Cannon (Tube and Breech)						12
Spare Tubes						26
Quantities (as shown in FY 1979 submission)						None

Other Appropriations: Not Applicable.

The above funding profiles and quantities differ primarily because at the time of preparation of the FY 1979 Congressional Descriptive Summary, the US Army had not made a decision to select a 120mm gun system for future incorporation into the XM1 tank, nor was there a definitized program for integration of such a weapon system into the XM1. Following the 30 January 1978 120mm gun decision, a definitized program for integration of the 120mm system into the XM1 tank was approved by the Army Systems Acquisition Review Council (ASARC) in April 1978 and subsequently by the Office of the Secretary of Defense (OSD). The current program reflects additional scope not envisioned in the FY 1979 submission, i.e., Protection/Survivability testing and refurbishment of a second XM1 pilot tank to 120mm configuration for physical teardown/maintenance evaluation.

* Program Element 6.36.16.A in FY 1979 submission.